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PART I
Bioventing Pilot Test Work Plan for
PS-2, PS-1A, PS-1B,
BUILDING 2034, BUILDING 2035
Fairchild Air Force Base, Washington

PART II
Draft Bioventing Pilot Test Interim Results Report for
PS-2, PS-1A, PS-1B,
BUILDING 2034, BUILDING 2035
Fairchild Air Force Base, Washington

VOLUME 2 OF 2

Prepared for
Air Force Center for Environmental Excellence
Brooks AFB, Texas
and
Fairchild Air Force Base, Washington

June 1994

Prepared by

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APPENDIX A

GEOLOGIC BORING LOGS

BORING LOG	Boring/Well No.:	VMP-1	1 of 1					
Installation:	FAIRCHILD AFB	Site:	PS-2					
Client/Project:	AFCEE		Contractor: ENGINEERING SCIENCE					
Drilling Contractor:	ENV WEST		Drillers: RICK MCCORCLE & TED MAY					
Drilling Started:	0 9-23-93	Drilling Ended:	0 9-23-93					
Drilling Method:	AUGER	Sampling Method:	SPLIT SPON					
Geologist:	S. THOMAS TAYLOR	Borehole Coordinates:	LS Altitude:					
DEPTH (feet)	RECOVERY (%)	HEAD SPACE	CHEMICAL SAMPLES	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	USCS SOIL CLASSIFICATION	WELL LOG DATA	
		Amount (ppm)	Interval (feet)	No.	Interval (feet)			
5		2600 1062	0-6 "			0.0 - 2.0 GRAVELLY SAND, GRAY (NS-N6), VERY POORLY SORTED, ANGULAR, LOOSE - UNCONSOLIDATED, DAMP, FUEL ODOR, POSSIBLY FILM MATERIAL	18	
		8200 1453	24-27"	PSZ- VMP-1- 4	33-35 54-60 60-64	2.0-2.5 SILT WITH VERY FINE-GRAINED SAND, BROKEN ISH-BLACK, WEL SORTED, DAMP, FUEL ODOR, FIRM 2.5-3.3 SAND, GREENISH GRAY, FINE-GRAINED, MINER SILT, MOD. SORTING, MOD. ROUNDED, DAMP FUEL ODOR 3.3-5.5 SILTY SAND, SAND IS VERY FINEGRAINED DARK BROWN, POORLY SORTED, POORLY ROUNDED, OCCASIONAL PEBBLES, DAMP, FUEL ODOR, UN- CONSOLIDATED	40	
		6200 1409	48-54"			5.5-7.0 AS ABOVE BUT AVERAGE GRAIN SIZE INCREASING DOWNWARD	50	
		3900 1026	72-78"			7.0-8.0 NOT RECOVERED	55	
		9200 1304	96-102			8.5-8.6 SILT AND CLAY, DARK BROWN, POSSIBLY ORGANIC RICH, WET, FIRM, FUEL ODOR	7	
						8.6-9.0 SAND, GRAY, COARSE GRAINED, WELL SORTED, POORLY ROUNDED, WET, FUEL ODOR, UNCONSOLIDATED	26	
							40	
							50	
							4	
							14	
							30	
							50	
25								
30								

BORING LOG	Boring/Well No.: VMP-2				1 of 1	
Installation:	FAIRCHILD AFB				Site: PS-2 Project No: DE 268	
Client/Project:	AFCEE				Contractor: ENGINEERING - SCIENCE	
Drilling Contractor:	ENV. WEST				Drillers: RICK McCORKLE & TED MAY	
Drilling Started:	0 9-24-93		Drilling Ended:	0 9-24-93	OSHA Protection Level: D	
Drilling Method:	AUGER		Sampling Method:	SPLIT SPOONS	Borehole dia (in): 8"	
Geologist:	S. THOMAS TAYLOR		Borehole Coordinates:	LS Altitude:		
DEPTH (feet)	RECOVERY (X)	HEAD SPACE	CHEMICAL SAMPLES	LITHOLOGIC DESCRIPTION	GRAPHIC LOG USCS SOIL CLASSIFICATION BLAIS	WELL LOG DATA
RECOVERY (X)	Amount (ppm)	Interval (feet)	No.	Interval (feet)		
	2700 684	C - 0.5			0-2' C-GRAVEL, GRAY, POORLY SORTED, ANGULAR, DAMP FUEL ODOR, UNCONSOLIDATED. 6-28" SAND, GRAY, MOD SORTING, MOD. ROUNDED.; DAMP FUEL ODOR UNCONSOLIDATED. WITH PERCENT ALL SILT INCREASING DOWNWARD.	CL-100 20 10 76 40
	10,000+ 924	2.0 - 2.5			2-4 SAND, SILTY DARK BROWN, FINEGRAINED, MOD. ROUNDED MOD. SORTING, DAMP. FUEL ODOR, UNCONSOLIDATED SOME GRAVEL IN BOTTOM SIX INCHES (42-48").	2-10 20 10 10 10
5	8800 1155	4.0 - 4.5	PSR- VMP2- 4	4.5 - 6.0	4-6' AS ABOVE WITH GRAIN SIZE DECREASING DOWNWARD, FUEL ODOR	1-10 20 10 10
	2500 987	6.0 - 6.1			6-7" VERY FINE GRAINED SAND AND SILT, ROUNDED, MODERATE TO GOOD SORTING, DAMP, UNCONSOLIDATED FUEL ODOR. OCCASIONAL PEBBLES AND COBBLES	6-10 15 37
				T.D. 7'2"	SC last 2"	
10						
20						
25						
30						

BORING LOG	Boring/Well No:	VMP-1A RENAMED VMP-1	1 of 1		
Installation:	FAIRCHILD AFB	Site:	PS-1A		
Client/Project:	AFCCEE	Contractor:	ENGINEERING - SCIENCE		
Drilling Contractor:	ENV. WEST	Drillers:	RICK McCORKLE & TED MAY		
Drilling Started:	0 10-14-93	Drilling Ended:	0 10-14-93	OSHA Protection Level:	D
Drilling Method:	AUGER	Sampling Method:	SPLIT SPOON	Borehole dia (in):	7 1/2
Geologist:	S THOMAS TAYLOR	Borehole Coordinates:		LS Altitude:	

BORING LOG		Boring/Well No.: VMP-3			1 of 1		
Installation: FAIRCHILD AFB		Site: PS-1A	Project No: DE268				
Client/Project: AFCEE		Contractor: ENGINEERING SCIENCE					
Drilling Contractor: ENV. WEST		Drillers: RICK McCORKLE & TED MAY					
Drilling Started: 10-13-93		Drilling Ended: 10-13-93	OSHA Protection Level: D				
Drilling Method: AUGER		Sampling Method: SPLIT SPOON	Borehole dia (s): 8"				
Geologist: S. THOMAS TAYLOR		Borehole Coordinates:	LS Altitude:				
DEPTH (feet)	RECOVERY #	HEAD SPACE	CHEMICAL SAMPLES	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	USCS SOIL CLASSIFICATION	WELL LOG DATA
		Amount (spud)	Interval (feet)	No.	Interval (feet)		
5		8 NA	6-12"		0-6" NO RECOVERY 6-12" SILTY SAND, MINOR GRAVEL, DARK BROWN, FINE GRAINED WITH OCCASIONAL GRAVEL, POOR SORTING, MOD. GOOD ROUNDING, DRY, UNCONSOLIDATED	6 8 8	
		1500 NA	30-36"		12-24" SILTY SAND AND GRAVEL, DARK BROWN, FINE GRAINED WITH ABUNDANT GRAVEL, POOR SORTING, MOD. GOOD ROUNDING, DAMP, UNCONSOLIDATED.	3	
5		9700 NA	54-60"	PSIA- VMP-3	24-30" NO RECOVERY 30-36" GRAVEL, GRAY, MINOR COARSE SAND, MOD. GOOD ROUNDING, GOOD SORTING, DAMP, LOOSE, UNCONSOLIDATED.	2	
		2400 NA	72-78"	6	36-42 AS ABOVE 42-48 SILTY SAND, DARK BROWN, FINE TO COARSE GRAINED SAND, MOD. GOOD ROUNDING, MOD. SORTING, DAMP, UNCONSOLIDATED 48-54 - NO RECOVERY	3 2 2 2	
10				54-60" CLAYEY SILT, BROWNISH-BLACK, MINOR SAND, MEDIUM TO COARSE GRAINED, MOD. ROUNDING, VERY POOR SORTING, WET, FUEL ODOR, UNCONSOL. 60-72" AS ABOVE			
				72-78" SILTY SAND WITH CLAY, DARK BROWN, SAND IS VERY FINE GRAINED WITH OCC. COARSE SAND, VERY POORLY SORTED, MOD. ROUNDING, DAMP, UNCONSOLIDATED.		5	
15				78-84 - AS ABOVE 84-90 - SAND, OLIVE GREEN-GRAY, MED. GRAINED, GOOD SORTING, MOD. GOOD ROUNDING, WET, LOOSE- UNCONSOLIDATED.		5 5 5	
				90-96 CLAY, BROWN, WET, FIRM BUT UNCONSOL.		12	
20							
25							
30							

BORING LOG		Boring/Well No.: VW-1			1 of 1		
Installation: FAIRCHILD AFB.		Site: PS-1B	Project No: DE268				
Client/Project: AFCEE		Contractor: ENGINEERING - SCIENCE					
Drilling Contractor: ENV. WEST		Drillers: RICK McCORKLE & BILL FELDER					
Drilling Started: 10-20-93		Drilling Ended: 10-20-93	OSHA Protection Level: D				
Drilling Method: AUGER		Sampling Method: SPLIT SPOON	Borehole dia (s): 11"				
Geologist: S. THOMAS TAYLOR		Borehole Coordinates:	LS Altitude:				
DEPTH (feet)	RECOVERY (%)	HEAD SPACE	CHEMICAL SAMPLES	LITHOLOGIC DESCRIPTION	GRAPHICS	USCS SOIL CLASSIFICATION	WELL LOG DATA
		Amount (kg)	Interval (feet)	No.	Interval (feet)		
-2							
3.12		23	6-12"				
4		72	24-30"				
5		460	54-60	PSIB- VWI- 6	60-66 66-72 72-78	0-6" NO RECOVERY 6-12" SILTY SAND AND GRAVEL, DARK BROWN, POOR ROUNDING, POOR SORTING, DAMP, UNCONSOLIDATED. 12-18" AS ABOVE 18-24" SILTY SAND, MINOR CLAY, OCC. PEBBLES, DARK BROWN, DOMINANTLY FINE SAND WITH COM- MON COARSE GRAINS, MOD. ROUNDED, POOR SORTED, DAMP, UNCONSOLIDATED. 24-48" AS ABOVE 48-54 NO RECOVERY 54 - 66" SILTY SAND, AS ABOVE 66-80" SAND, MINOR SILT, GRAY, SAND IS FINE AND MEDIUM GRAINED, MOD. ROUNDED, MOD.SORTED, (MINOR TO TRACE CLAY), WET, STRONG FUEL ODOR, UNCONSOL. 80-96" CLAY AND SAND, WITH SILT, GRAY, SAND IS FINE TO COARSE SIZE, MOD. ROUNDED, POOR SORTED, WET, FUEL ODOR, FIRM BUT UNCONSOLIDATED.	7,5 10 10 5,2 7 10
6							
7.8		8100	78-84				
10							
15							
20							
25							
30							

BORING LOG		Boring/Well No.: VMP-1			1 of 1
Installation: FAIRCHILD AFB		Site: PS-1B		Project No: DEZ68	
Client/Project: AFCEE		Contractor: ENGINEERING - SCIENCE			
Drilling Contractor: ENU. WEST		Drillers: RICK McCORKLE & TED MAY			
Drilling Started: 0 10-21-93.		Drilling Ended: 0		OSHA Protection Level: D	
Drilling Method: AUGER		Sampling Method: SPLIT SPOON		Borehole dia (in): 8"	
Geologist: S. THOMAS TAYLOR		Borehole Coordinates:		LS Altitude:	
DEPTH (feet)	RECOVERY	HEAD SPACE		LITHOLOGIC DESCRIPTION	WELL LOG DATA
		Amount (spoon)	Interval (feet)		
4		6-12'			
		12-18			
		18-24			
		24-30			
		30-36			
		36-48			
		48-54			
5					
		PS1B-			
		VMP-			
		5.5			
		54-60			
		60-66			
		66-72			
10					
		1000	72-78	0-6" NO RECOVERY 6"-24" SILTY SAND, MINOR CLAY, MINOR GRAVEL, DARK BROWN-BLACK, MOD. ROUNDED, MOD. SORTED, DAMP, FUEL ODOR, UNCONSOLIDATED.	
		500	78-84	24-30" NO RECOVERY	
		300	84-90	30-36" SILTY SAND, DARK BROWN-BLACK, VERY FINE GRAINED, MOD. SORTED, MOD. ROUNDED, DAMP, FUEL ODOR, UNCONSOLIDATED	
		150	90-96	36-48" AS ABOVE	
				48-54" SILTY SAND WITH CLAY, DARK BROWN-GRAY, SAND IS VERY FINE GRAINED, MOD. ROUNDED, MOD. TO POORLY SORTED, DAMP, FUEL ODOR, UNCONSOLIDATED.	
				54-60" AS ABOVE	
				60-72" SAND, MINOR SILT, DARK GRAY, MED. TO COARSE GRAINED, MOD. SORTING, MOD. ROUNDED, WET AT BOT- TOM OF INTERVAL.	
15					
				72-78 - SAND, MINOR SILT, DARK GRAY-BLACK, MED. TO COARSE GRAIN, MOD. WELL SORTED, MOD. ROUNDED, WET, FUEL ODOR, UNCONSOL. - LOOSE.	
				78-84 AS ABOVE	
				84-90 SAND AS ABOVE BUT COARSE GRAIN SIZE DOMINANT	
				90-92 SAND AS ABOVE	
				92-96 CLAY, GRAY, WET, FIRM BUT UNCONSOLIDATED	
				60" - SAND	
20					
25					
30					

BORING LOG		Boring/Well No.: VMP-2			1 of 1			
Installation: FAIRCHILD AFB		Site: PS-1B		Project No: DE268				
Client/Project: AFCEE		Contractor: ENGINEERING SCIENCE						
Drilling Contractor: ENV. WEST		Drillers: RICK MCCORKLE & GUL FELDER						
Drilling Started: 0 10-20-93		Drilling Ended: 0 10-20-93		OSHA Protection Level:				
Drilling Method: AUGER		Sampling Method: SPLIT SPOON			Borehole dia (s): 8"			
Geologist: S. THOMAS TAYLOR		Borehole Coordinates:			LS Altitude:			
DEPTH (feet)	RECOVERY %	HEAD SPACE	CHEMICAL SAMPLES		LITHOLOGIC DESCRIPTION	GEOLOGIC LOG		
		Amount (spoon)	Interval (feet)	No.	Interval (feet)	USCS SOIL CLASSIFICATION		
2-54		4220 4445	0-6 6-12		0-6" SILTY SAND AND GRAVEL, DARK BROWN, SAND IS DOMINANTLY FINE GRAINED, COMMON COARSE GRAINS, COMMON TO MINOR PEBBLES, VERY POORLY SORTED, MOD. ROUNDED, DAMP, UNCONSOLIDATED.	7 10 5		
2-400		4400	24-30		6-12" AS ABOVE 12-30" SILTY SAND, MINOR GRAVEL, DARK BROWN, SAND IS DOMINANTLY FINE GRAINED, COMMON COARSE GRAINS, TRACE PEbble SIZE GRAVEL, MOD. ROUNDING, POOR SORTING, DAMP, -FUEL ODOR, UNCONSOLIDATED	10 5 10 3 3		
4-606	5	4800	48-54		30-66" SILTY SAND, DARK BROWN-BLACK, SAND IS VERY FINE GRAINED, DAMP, UNCONSOLIDATED, STRONG FUEL ODOR.	2 3 4 6		
5		10000	77-78"		66-96" SAND, TRACE SILT AND CLAY, GRAY, MEDIUM GRAIN SAND, POOR TO MOD. ROUNDED, GOOD SORTING, WET BELOW 6 FEET, STRONG FUEL ODOR, UNCONSOLIDATED.	18 15 15 15		
10								
15								
20					WATER AT 75.5" BGS IN MW 208, THIS LOCATION IS APPROXIMATELY 1' HIGHER THAN WELL SAND STARTS AT 66"			
25								
30								

BORING LOG		Boring/Well No.: VMP-3			1 of 1	
Installation: FAIRCHILD AFB		Site: PS-1B	Project No: DE 268			
Client/Project: AFCEE.		Contractor: ENGINEERING-SCIRACE				
Drilling Contractor: ENV. WRST		Drillers: RICK McCORRILE & TED MAY				
Drilling Started: 0 10-22-93		Drilling Ended: 0 10-22-93		OSHA Protection Level: □		
Drilling Method: AUGER		Sampling Method: SPLIT SPOON		Borehole dia (in): 8"		
Geologist: S. THOMAS TAYLOR		Borehole Coordinates:		LS Altitude:		
DEPTH feet	RECOVERY	HEAD SPACE	CHEMICAL SAMPLES	LITHOLOGIC DESCRIPTION		
		Amount Loaded	Interval (feet)	No.	Interval (feet)	
0-2		1000	0-6			
957		10	6-12			
		1000	12-24			
-4		3900	20-36			
0.03		10000+	42-48			
4-6	5-	10000+	54-60			
0.10		10000+	60-66			
-8		10000+	66-72			
10.18		10000+	72-78			
		10000+	78-84			
		10000+	84-90			
		10000+	90-96			
10						
15						
20						
25						
30						

BORING LOG	Boring/Well No.:	VW-1	1 of 1
Installation: FAIRCHILD AFB		Site: 2034	Project No: DEZ68
Client/Project: AFCEE		Contractor: ENGINEERING - SCIENCE	
Drilling Contractor: ENV. WEST		Drillers: RICK McCORKLE & TED MAY	
Drilling Started: 0	9/30/93	Drilling Ended: 0	9/30/93
OSHA Protection Level: D			
Drilling Method: AUGER	Sampling Method: SPLIT SPOON	Borehole dia (s):	11 "
Geologist: S. THOMAS TAYLOR	Borehole Coordinates:	LS Altitude:	

Installation: FAIRCHILD AFB

Site: 2034

Project No.: DE 268

Client/Project: AFCEE

Contractor: ENGINEERING SCIENCE

Drilling Contractor: ENV. WEST

Orillers: RICK MC

Drilling Started: 0 10-1-93

Drilling Ended: 0 10-1-93

Drilling Method: AUGER

Sampling Method: SPLIT SPOT

Geologist: S. THOMAS TAYLOR

LS Altitude:

— 1 —

5 HEAD CHEMICAL

8

BORING LOG		Boring/Well No.:	VMP-3	1 of 1	
Installation:		FAIRCHILD AFB		Site: B2034	Project No: DE268
Client/Project:		AFCEE		Contractor: ENGINEERING SCIENCE	
Drilling Contractor:		ENV. WEST		Drillers: RICK McCORKLE & TED MAY	
Drilling Started: 0 10-4-93		Drilling Ended: 0 10-4-93		OSHA Protection Level: D	
Drilling Method: AUGER		Sampling Method: SPLIT SPOON		Borehole dia (s): 8"	
Geologist: S. THOMAS TAYLOR		Borehole Coordinates:		LS Altitude:	
DEPTH (feet)	RECOVERY %	HEAD SPACE	CHEMICAL SAMPLES	LITHOLOGIC DESCRIPTION	GRAPHIC LOG USCS SOIL CLASSIFICATION WELL LOG DATA
		Amount (spoon)	Interval (feet)	No.	Interval (feet)
0-2					
2-4					
4-6					
6-8					
8-10					
10-12					
12-14					
14-16					
16-18					
18-20					
20-22					
22-24					
24-26					
26-28					
28-30					
30-32					
32-34					
34-36					
36-38					
38-40					
40-42					
42-44					
44-46					
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BORING LOG

Boring/Well No.:

VW-1

1 of 1

Installation: FAIRCHILD AFB

Site: B2035

Project No: DE 268

Client/Project: AFCEE

Contractor: ENGINEERING- SCIENCE

Drilling Contractor: ENV. WEST

Drillers: RICK MCCORCLE & Ted May

Drilling Started: 10-4-93

Drilling Ended: 10-9-93

OSHA Protection Level: D

Drilling Method: AUGER

Sampling Method: SPLIT SPOON

Borehole dia (in): 11"

Geologist: S. THOMAS TAYLOR

Borehole Coordinates:

LS Altitude:

DEPTH (feet)	RECOVERY %	HEAD SPACE		CHEMICAL SAMPLES		LITHOLOGIC DESCRIPTION	GRAPHIC LOG	USCS SOIL CLASSIFICATION	WELL LOG DATA
		Amount Grams	Interval (feet)	No.	Interval (feet)				
0	8	6-12				0-6" NO RECOVERY 6-12" SILTY SAND AND GRAVEL, BROWN, POORLY SORTED, (OCC. GRAVEL), MOD. ROUNDED, DRY, UNCONSOLIDATED. 12-24" SILTY SAND MINOR CLAY, BROWN, POORLY SORTED, MOD. ROUNDING, DAMP UNCONSOLIDATED, OCC. GRAVEL.	XX	1 2 3 4	
2	2	36-42				24-36" NO RECOVERY. 36"-48" SILTY SAND AND GRAVEL, BROWN, MOD. ROUNDED, POORLY SORTED, (OCC. GRAVEL) DAMP, UNCONSOLIDATED.	X	5 6 7 8 9	
4	0					48-54" NO RECOVERY 54-60" SILTY SAND, WITH CLAY, BROWN MOD. ROUNDED, POORLY SORTED, DAMP, COHESIVE BUT UN- CONSOLIDATED.	—	10 11 12	
6	9	54-60				60-72" SILTY SAND, MINOR CLAY, GRAYISH DARK BROWN, POORLY SORTED, MOD. ROUNDING, DAMP, UNCONSOLIDATED.	XX	13 14	
8	12	72-78				72-78" SILTY SAND, BROWN, MOD. ROUNDED, V. POOR SORT- ING, OCC COARSE SAND, NOMINANTLY FINE GRAINED SAND, MICA FLAKES, DAMP, UNCONSOLIDATED, OCC. PEBBLES.	—	15 16 17	
10	2	84-90	B2035- VW1- 8	84-90"		78-90" AS ABOVE.	—	18 19	
12	840	90-96		96-102"		90-96" SILTY SAND, BROWN, MOD. ROUNDING, POOR SORTING, OCC, CLAYEY LUMPS, DAMP, UNCONSOL., MICACEOUS.	—	20 21	
14	503	102-108		102-108"		96-102" CLAYEY SAND, GRAYISH BROWN, MOD. ROUNDING, POOR SORTING, FIRM, DAMP.	—	22 23	
16	6400	108-114				102-108" CLEAN SAND, GRAY, MOD. ROUNDING, GOOD SORTING, WET, UNCONSOLIDATED, FUEL ODOR.	—	24 25	
18	2430					108-114" SILTY SAND, BROWN, MOD. ROUNDING, VERY POOR SORT- ING, OCC. PEBBLES OF ANGULAR BASALT, DAMP, UNCONSOL. OCC LUMPS OF BROWN CLAY.	—	26 27	
20						114"-123" - AS ABOVE	—	28 29	
25						123-126" BROWN CLAY, WLT. FIRM, UNCONSOLIDATED	—	30 31	
30							—	32 33	

BORING LOG		Boring/Well No:	VMP-1		1 of 1			
Installation:		FAIRCILD AFB		Site:	B 2035	Project No:	DR 268	
Client/Project:		AFCEE		Contractor:	ENGINEERING - SCIENCE			
Drilling Contractor:		ENV. WEST		Drillers:	RICK McCORKLE & TED MAY			
Drilling Started:		10-4-93		Drilling Ended:	10-4-93	OSHA Protection Level:	3	
Drilling Method:		AUGER		Sampling Method:	SPLIT SPOON	Borehole dia (in):	8"	
Geologist:	S. THOMAS TAYLOR	Borehole Coordinates:			LS Altitude:			
DEPTH (feet)	RECOVERY	HEAD SPACE	CHEMICAL SAMPLES	LITHOLOGIC DESCRIPTION		GRAPHIC LOG	USCS SOIL CLASSIFICATION	WELL LOC DATA
		Amount (feet)	Interval (feet)	No.	Interval (feet)			
0		8	6-12					
5		8	30-36					
5		0	54-60					
5		94	70-84	B2035- VMP1- 7	66-72			
10		150	96-?		84-90			
10		724	90-96					
10								
15								
20								
25								
30								

0-6" NO RECOVERY 6-12" SILTY SAND AND GRAVEL, BROWN, POOR ROLLING, VERY POOR SORTING, DAMP, UNCONSOLIDATED.
 12-24" SILT AND SAND, COMMON GRAVEL, BROWN, POOR ROLLING, POOR SORTING, DAMP, UNCONSOLIDATED.
 24-30" NO RECOVERY. 30-36" SILTY SAND, MINOR CLAY, TRACE GRAVEL, BROWN, MOD. ROUNDING, V. POOR SORTING, DAMP, UNCONSOLIDATED,
 36-48" SILT AND SAND, COMMON GRAVEL, BROWN, POOR ROLLING, POOR SORTING, DAMP, UNCONSOLIDATED.
 48-54" NO RECOVERY. 54-60" SILTY SAND, SOME CLAY, BROWN, MOD. ROUNDING, V. POOR SORTING, (OCC. GRAVEL). DAMP, UNCONSOLIDATED.
 60-72" AS ABOVE.
 72-78" NO RECOVERY.
 78-84" CLAYEY SILT AND SAND, BROWNISH BLACK, POOR SORTING, MOD. ROUNDING, DAMP, COHESIVE, BUT UNCONSOLIDATED..
 84-96" AS ABOVE
 96-?" SILTY SAND WITH CLAY, DARK BROWN, MOD. ROUNDING, MOD-POOR SORTING, DAMP, UNCONSOLIDATED, (BASALT COBBLE PLACED SPOON AFTER 3" OF RECOVERY).
 102-120" NO RECOVERY

POSSIBLE FINE
PRODUCT AT
96 to 10'

5' Silty Sand w/clay

7.5' Clayey Silt w/sand

BORING LOG | Boring/Well No.:

VMP-3A RENAMED VMP-2 ..

1 of 1

Installation:	FAIRCHILD AFB	Site:	B203S	Project No:	PE268	
Client/Project:	AFCEE	Contractor:	ENGINEERING - SCIENCE			
Drilling Contractor:	ENV. WEST	Drillers:	RICK McCORKLE & TLD MAY			
Drilling Started:	10-6-93	Drilling Ended:	10-6-93	OSHA Protection Level:		A
Drilling Method:	Auger	Sampling Method:	SPLIT SPOON	Borehole dia (s): 8"		
Geologist:	S. THOMAS TAYLOR	Borehole Coordinates:		LS Altitude:		

BORING LOG

Boring/Hell No.:

VMP-2 - RENAMED VMR-3.

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Installation: ~~DATA CENTER~~ FAIRCHILD - AFB

SITE B 2035

Project No: DE 218

Client/Project: AFCEC

Contractor: FAULKNER ENGINEERING - SCIENCE

Drilling Contractor: ENV. WEST

Officers: RICK McCORRILE & TED MAY

Drilling Started: 10 / 5 - 93

Entered: 0 10-5-93

Drilling Method: Auger

Method: *split sample*

Geologist: S. Thomas Taylor

Altitude: " " ft.

10. *Leucosia* *leucostoma* *leucostoma* *leucostoma*

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www.english-test.net

LS Altitude: "14"

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DEPTH (feet)	RECOVERY (%)	CHEMICAL SAMPLES		LITHOLOGIC DESCRIPTION	GRAPHIC LOG	USCS SOIL CLASSIFICATION
		Amount Recovered	Interval (feet)	No.	Interval (feet)	
12	0%					
18	8	18-24"			18-24" SILTY SAND, BLACK, MODERATELY SORTED, SAND IS LIGHTER THAN GRAVEL & COARSE, VERY VIGOROUSLY SORTED, POORLY GRADED, OCC GRAVEL, DAMP, UNCONSOLIDATED 24-30 NO RECOVERY	30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
30	8	30-36"			30-36" SILTY SAND, BROWN, DOMINANTLY VERY FINE SAND, MOD. ROUNDED, VERY POORLY SORTED, OCC. GRAVEL DAMP, UNCONSOLIDATED.	
36	8	36-42"			36-42" SAND WITH SILT AND CLAY, BROWN, DOMINANTLY, COARSE SAND, OCC. GRAVEL, MOD. ROUNDED, VERY POORLY SORTED, DAMP, UNCONSOLIDATED. 42-48" AS ABOVE.	
48	8	48-54"			48-54" NO RECOVERY.	
54	70	54-60"			54-60" SILTY SAND AND GRAVEL, BROWN, DOMINANTLY FINE GRAINED SAND, MINOR CLAY, MOD. ROUNDED, POORLY SORTED DAMP, UNCONSOLIDATED.	
60	623	60-72"			60-72" SILTY SAND, BROWN, DOMINANTLY COARSE GRAINED SAND WITH MINOR CLAY, COMMON GRAVEL, POORLY SORTED, DAMP, UNCONSOLIDATED.	5 4 3 2 1 0
72	78	72-78"			72-78" NO RECOVERY.	
78	78	78-84"			78-84" SAND, BLACK, OCC. GRAVEL, MOD. SORTED, MOD. ROUNDED, DAMP, UNCONSOLIDATED, SLIGHT FUEL ODOR.	
84	78	84-96"			84-96" AS ABOVE, STRONG FUEL ODOR.	
96	78	96-102"			96-102" NO RECOVERY	
102	78	102-120"			102-120" SAND, AS ABOVE	
120						
140						
160						
180						
200						
220						
240						
260						
280						
300						

BORING LOG		Boring/Well No.: VMPB1			1 of 1				
Installation: FAIRCHILD AFB		Site: 1099	Project No: DE268						
Client/Project: AFCEE		Contractor: ENGINEERING SCIENCE							
Drilling Contractor: ENV. WEST		Drillers: DAN CLASSEN & RON SINK							
Drilling Started: 0 10-23-93		Drilling Ended: 0 10-23-93		OSHA Protection Level: D					
Drilling Method: AUGER		Sampling Method: SPLIT SPOON		Borehole dia (s): 8"					
Geologist: S. THOMAS TAYLOR		Borehole Coordinates:		LS Altitude:					
DEPTH (feet)	RECOVERY (%)	HEAD SPACE		CHEMICAL SAMPLES		LITHOLOGIC DESCRIPTION	GRAPHICS	USCS SOIL CLASSIFICATION	WELL LOG DATA
		Amount (spnd)	Interval (feet)	No.	Interval (feet)				
2									
12.43									
14									
16.49									
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BORING LOG

Boring/Well No.: PS-1... BUMP: PSI-VMPBZ...

• 1 of 1

InstaNation

-FAIRCHILD AFB

Site: PS-

Project No: DE 268

Giant/Project:

AFCEE

Contractor: ENGINEERING - SCIENCE

Drilling Contracts

ENV. WEST

DIRECTOR: JAN CLAASSEN AND RON SINK

Drilling Started: 0 10-23-93

Entered: 0 10-23-93

OSHA Protection Level: A

Drawing Method: Auger

Method: SPONT SPOON.

Borehole dia (s):

Geologist ^{to S.S.} THOMAS TAYLOR

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LS Altitude:

10. *Chlorophytum comosum* L.

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HEAD **CHEMICAL**

LS Altitudes

LITHOLOGIC DESCRIPTION

APPENDIX B

O&M MANUAL AND

DATA COLLECTION SHEET

GENERIC BIOVENTING BLOWER SYSTEM OPERATIONS AND MAINTENANCE MANUAL FOR EXTENDED PILOT TESTING

Prepared For

**Air Force Center for Environmental Excellence
Brooks AFB, Texas
USAF Contract F33615-90-D-4014 Delivery Order 14**

ES

Engineering-Science, Inc.

April 1993

**1700 BROADWAY, SUITE 900
DENVER, COLORADO 80290**

**GENERIC BLOWER SYSTEM
OPERATIONS AND
MAINTENANCE MANUAL
FOR
EXTENDED PILOT TESTING
SYSTEM**

Prepared for:
**AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AFB, TEXAS**

USAF CONTRACT F33615-90-D-4010, DELIVERY ORDER 14

April 1993

Prepared by:

**Engineering-Science, Inc.
1700 Broadway, Suite 900
Denver, Colorado**

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2.0 Blower System Configuration Summary.....	2.1
3.0 Bioventing System Operation.....	3.1
3.1 Principle of Operation	3.1
3.2 System Description.....	3.1
3.2.1 Blower System.....	3.1
3.2.2 Monitoring Gauges	3.1
4.0 System Maintenance	4.1
4.1 Blower/Motor	4.1
4.2 Knock-Out Chamber.....	4.1
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4.5 Major Repairs.....	4.2

FIGURES

<u>No.</u>	<u>Title</u>	<u>Page</u>
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APPENDIX A Regenerative Blower Information

APPENDIX B Rotary-Vane Blower Information

APPENDIX C Data Collection Sheets

SECTION 1

INTRODUCTION

This document has been prepared by Engineering-Science, Inc. to support the bioventing initiative contract awarded by the Air Force Center for Environmental Excellence. The contract involves the conducting of bioventing pilot tests at 35 sites on 23 Air Force bases across the United States.

At most sites, bioventing systems will be installed upon completion of the initial bioventing pilot tests for the purpose of extended pilot testing. These systems will operate for a 1-year period to provide further information as to the feasibility of the technology at each site, and to provide interim remedial action.

This Operations and Maintenance Manual has been created for sites at which regenerative or rotary-vane blowers have been installed for extended pilot testing. Basic maintenance of these systems is the responsibility of the Air Force facility. This manual is to be used by facility personnel to guide and assist them in operating and maintaining the blower system. Section 2 provides a summary of the bioventing system components installed. Section 3 of this document describes the blower system. Section 4 details the maintenance requirements and provides maintenance schedules. Section 5 describes the system monitoring that is required to forecast system maintenance needs and to provide data for the extended pilot test. Blower performance curves and relevant service information for regenerative and rotary-vane blowers are provided in Appendices A and B, respectively, and data collection sheets are provided in Appendix C.

SECTION 2

BLOWER SYSTEM CONFIGURATION SUMMARY

System Type (injection, extraction) _____

Blower (regenerative, rotary vane) _____

Blower Model _____

Motor (Hp) _____

Knock-Out Chamber (yes, no) _____

Sampling Port (yes, no) _____

Inlet Temperature Gauge (range) _____

Inlet Pressure/Vacuum Gauge (range) _____

Inlet Filter (part no.) _____

Outlet Temperature Gauge (range) _____

Outlet Pressure/Vacuum Gauge (range) _____

Pressure/Vacuum Relief Valve Set @ (give unit of measure) _____

SECTION 3

BIOVENTING SYSTEM OPERATION

3.1 PRINCIPLE OF OPERATION

Bioventing is the forced injection of fresh air, or withdrawal of soil gas, to enhance the supply of oxygen for *in situ* bioremediation. Either a pressure (air injection) or vacuum (vapor extraction) blower unit is used to inject or withdraw air into or from the soil, thereby supplying fresh air with 20.8 percent oxygen to the contaminated soils. Once oxygen is provided to the subsurface, existing bacteria will proceed with the breakdown of fuel residuals.

At _____ a _____ blower system has been installed.

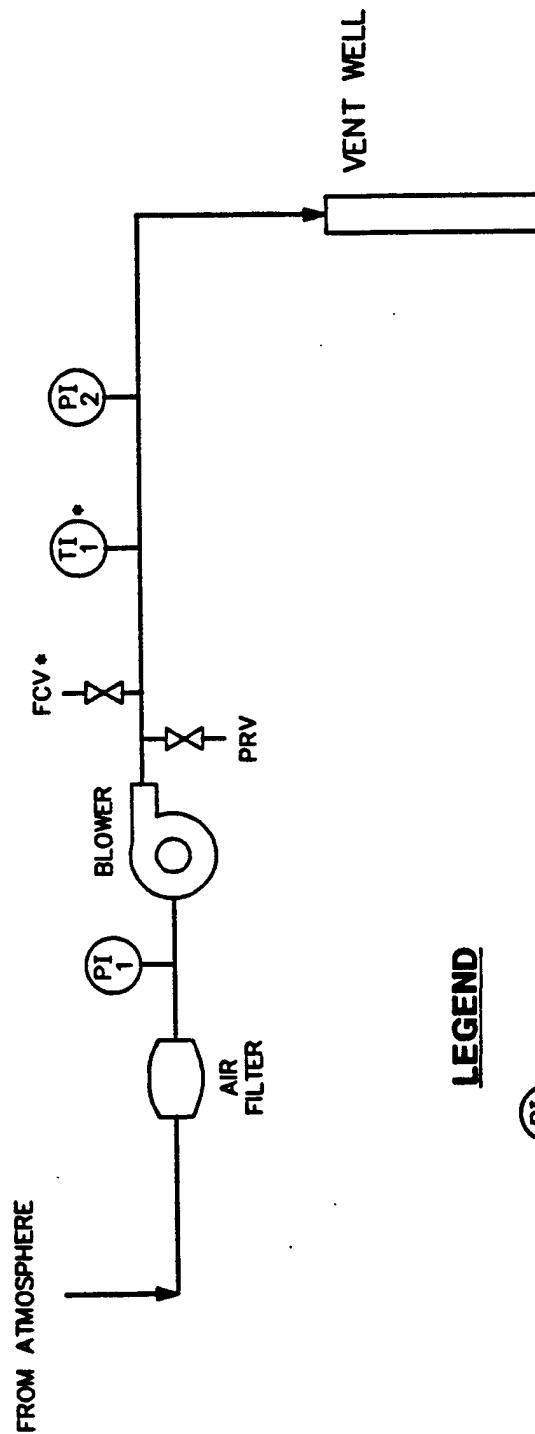
3.2 SYSTEM DESCRIPTION

3.2.1 Blower System

A _____ blower powered by a _____ horsepower direct-drive motor is the workhorse of the bioventing system. This blower is rated at a flow rate of _____ standard cubic feet per minute (scfm) at a pressure of _____; however, the actual performance of the blower will vary with changing site conditions. As installed, the blower was producing an estimated flow rate of _____ scfm at a pressure of _____. Vapor extraction systems may include an inlet knockout chamber for water condensation. All systems include an air filter to remove any particulates which are entrained in the air stream, and several valves and monitoring gauges which are described in the next section. A schematic of the blower system installed at _____ is shown on Figure 3.1. Corresponding blower performance curves, and relevant service information are provided in Appendices A and B.

3.2.2 Monitoring Gauges

The bioventing system is equipped with vacuum and pressure gauges, temperature gauges, and a sampling port (vapor extraction only). Generally, gauges have been installed on the air injection system at the following locations: a vacuum gauge in the inlet piping and a pressure gauge in the outlet piping. For vapor extraction systems gauges are generally installed as follows: vacuum gauges in the



LEGEND

- (PI₁) PRESSURE INDICATOR
- (T₁) TEMPERATURE INDICATOR
- FCV FLOW CONTROL VALVE
- PRV PRESSURE RELIEF VALVE
- * OPTIONAL

FIGURE 3.1

TYPICAL BLOWER SYSTEM
INSTRUMENTATION DIAGRAM
FOR AIR INJECTION

inlet piping and at the knock-out chamber (as applicable), and a pressure gauge in the discharge piping. See Figure 3.1 for the locations of the gauges installed on the blower system at this site.

Temperature gauges may be located at the inlet and outlet of the blower system. These gauges are used to monitor the inlet and outlet temperature to determine the change in temperature across the blower. For air injection systems, ambient air temperature should be used when an inlet temperature gauge is not present. For vapor extraction systems, the inlet temperature is also used as an estimate of soil gas temperatures in the contaminated soil zone. See Figure 3.1 for the location(s) of the temperature gauges installed on the blower system at this site.

A sample port is located in the discharge piping on the outlet side of vapor extraction systems only. This sample port is used to collect offgas that is analyzed for carbon dioxide/oxygen and volatile organic compound concentrations. See Figure 3.1 for the location of the sampling port installed on the blower system at this site.

SECTION 4

SYSTEM MAINTENANCE

Although the motor and blower are relatively maintenance free, periodic system maintenance is required for proper operation and long life. Recommended maintenance procedures and schedules are described in detail in the instruction manuals included in Appendices A and B and briefly summarized in this section.

Filter inspection and knock-out chamber draining (as applicable) must be performed with the system turned off. To re-start the motor, open the manual air dilution valve (red handle) to protect the motor from excessive strain, start motor, and slowly close dilution valve. If the handle has been removed from the manual air dilution valve, do not open the valve or otherwise change the setting (it has been pre-set for a specific flow rate) before re-starting the blower.

4.1 Blower/Motor

The blower and motor are relatively maintenance free and should not require any periodic maintenance during the 1-year extended testing period. Both blower and motor have sealed bearings and do not require lubrication.

4.2 KNOCK-OUT CHAMBER

This section applies only to vapor extraction systems equipped with moisture knock-out chamber. To avoid damage caused by passing liquids solids through the blower a knock-out chamber has been installed in-line before the blower.

Free liquid should not be pumped through the blower. The knock-out chamber installed in-line before the blower intercepts entrained liquid, preventing damage to the blower. The knock-out chamber should be drained into an appropriate container once a month for the first few months and at less frequent intervals thereafter, if it appears that this will be sufficient to keep liquid from building up in the knock-out chamber. Condensation generally increases during the cold winter months. A facility employee should determine the best schedule for draining the knock-out chamber. The knock-out chamber can be drained by turning the system off and removing the cap or opening the valve at the base of the knock-out chamber. When all of the liquid has drained out, the system can be turned back on. It is recommended when re-starting the system that the air dilution valve (red-handled valve) be opened to protect the motor from excessive strain. If oily, drained liquids should be disposed of in an oil/water separator.

4.3 AIR FILTER

To avoid damage caused by passing solids through the blower, an air filter has been installed in-line before the blower. The filter element is paper and is accompanied by a polyurethane foam prefilter. The filter should be checked weekly for the first 2 months of operation. Again, a facility employee should determine the best schedule for filter replacement. The polyurethane prefilters can be washed with lukewarm water and a mild detergent. Paper filter elements should never be washed, but should be disposed of and replaced as necessary. When the pressure or vacuum drop across the filter is above 15 inches of water, a dirty filter element should be suspected, and cleaning or replacement should be performed.

To remove the filter, loosen the three clamps or the wing nut, lift the metal top off the air filter, and lift the air filter from the metal housing. Remove the polyurethane prefilter (if applicable) and wash before replacing. When replacing the filter, be careful that the rubber seals remain in place.

The filter element is manufactured by Solberg Manufacturing, Inc. in Itasca, Illinois. Their telephone number is (708) 773-1363. Additional filters can also be obtained through Engineering-Science, Inc. in Denver, Colorado. The ES contacts are Mr. Brian Blicker and _____ and they can be reached at (303) 831-8100. The filter model number is _____, and the number for the replacement element is _____. It is recommended that _____ keep at least one spare air filter at the site, four spare filters were supplied with the blower system.

4.4 MAINTENANCE SCHEDULE

The following maintenance schedule is recommended for this system. During the initial months of operation more frequent monitoring is recommended to ensure that any startup problems are quickly corrected. A daily drive-by inspection is recommended during the initial 2 weeks of operation to ensure that the blower system is still operating with no unusual sounds. Data collection sheets that can be used to record maintenance activities are included in Appendix C.

<u>Maintenance Item</u>	<u>Maintenance Frequency</u>
Filter	Check once per month, wash or replace as necessary (see Section 4.3).
Knock-out chamber	Drain once per month initially, then periodically (see Section 4.2).

4.5 MAJOR REPAIRS

Blowers systems are very reliable when properly maintained. Occasionally, a motor or blower will develop a serious problem. If a blower system fails to start, and a qualified electrician verifies that power is available at the blower or starter,

the Engineering-Science, Inc. site manager _____ should be called at (____) _____. ES is responsible for major repairs during the first year of operation.

SECTION 5

SYSTEM MONITORING

5.1 BLOWER PERFORMANCE MONITORING

To monitor the blower performance, vacuum, pressure, and temperature will be measured. These data should be recorded weekly on a data collection sheet (provided in Appendix C). All measurements should be taken at the same time while the system is running. Because the system is loud, hearing protection should be worn at all times.

5.1.1 Vacuum/Pressure

With hearing protection in place, open the blower enclosure and record all vacuum and pressure readings directly from the gauges (in inches of water or psi). Record the measurements on a data collection sheet (Appendix C).

5.1.2 Flow Rate

The flow rate through the vent well and soils can be calculated when the inlet vacuum and outlet pressure of the blower are known. This pressure change across the blower (vacuum + pressure) can be compared to the performance curves for the blower in Appendix A or Appendix B to determine the approximate flow rate.

5.1.3 Temperature

With hearing protection in place, open the blower enclosure and record the temperature readings directly from the gauges in degrees Fahrenheit ($^{\circ}\text{F}$). Record the measurements on a data collection sheet (provided in Appendix C). The temperature change can be converted to degrees Celsius ($^{\circ}\text{C}$) using the formula $^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 5/9$.

5.3 MONITORING SCHEDULE

The following monitoring schedule is recommended for this system. During the initial months of operation, more frequent monitoring is recommended to ensure that any start up problems are quickly corrected. Data collection sheets have been provided to assist your data collection and are included in Appendix C.

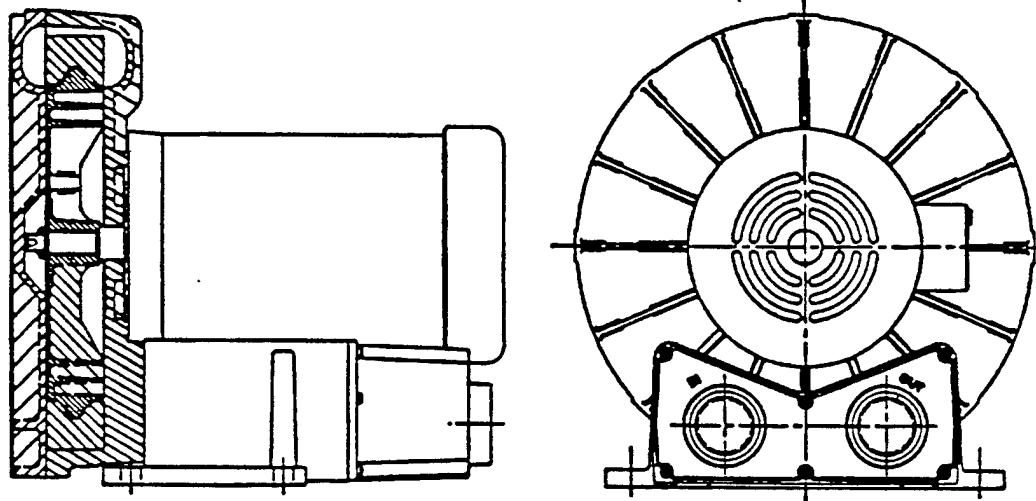
<u>Monitoring Item</u>	<u>Monitoring Frequency</u>
Vacuum/Pressure	Daily during first week, then once per week.
Temperature	Daily during first week, then once per week.

APPENDIX A
REGENERATIVE BLOWER INFORMATION



Post Office Box 97
 Benton Harbor, Michigan 49023-0097
 Ph: 616/926-6171
 Fax: 616/925-8288

Maintenance Instructions for Gast Standard Regenerative Blowers



For original equipment manufacturers
 special models, consult your local distributor

Gast Rebuilding Centers

Gast Mfg. Corp.

2550 Meadowbrook Rd.
 Benton Harbor MI. 49022
 Ph: 616/926-6171
 Fax: 616/925-8288

Gast Mfg Corp.

505 Washington Avenue
 Carlstadt, N. J. 07072
 Ph: 201/933-8484
 Fax: 201/933-5545

Brenner Fiedler, & Assoc.

13824 Bentley Place
 Cerritos, CA. 90701
 Ph: 213/404-2721
 Fax: 213/404-7975

Wainbee, Limited

121 City View Drive
 Toronto, Ont. Canada M9W 5A9
 Ph: 416/243-1900
 Fax: 416/243-2336

Wainbee, Limited

215 Brunswick Drive
 Pointe Claire, P.Q. Canada H9R 4R7
 Ph: 514/697-8810
 Fax: 514/697-3070

Gast Mfg. Co. Limited.

Halifax Rd, Cressex Estate
 High Wycombe, Bucks HP12 3SN
 Ph: 44 494 523571
 Fax: 44 494 436588

Japan Machinery Co. Ltd.

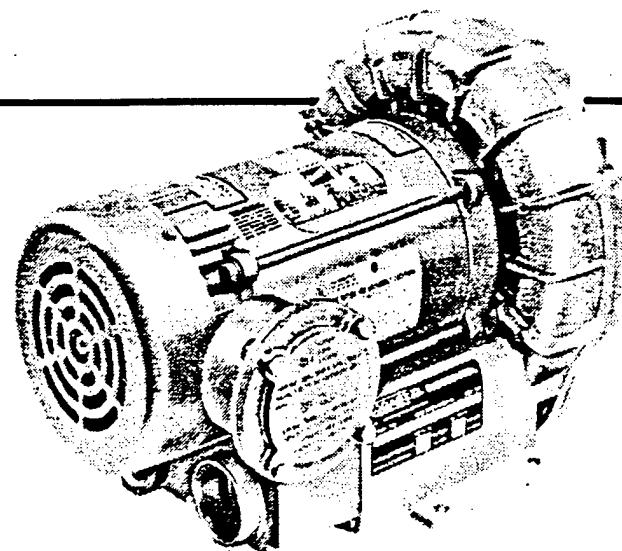
Central PO Box 1451
 Tokyo 100-91 Japan
 Ph: 813/3573-5421
 Fax: 813/3571-7865

Regenerative Blowers For Soil Remediation

(5-91)



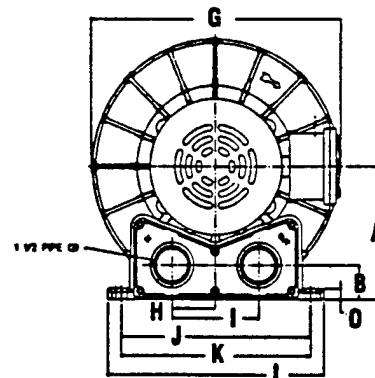
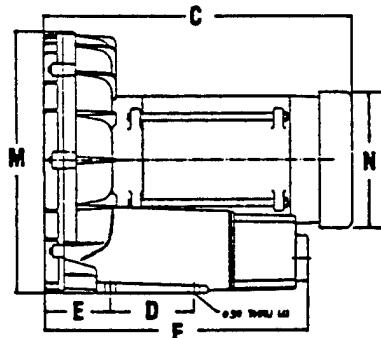
R4, R5, R6P Series



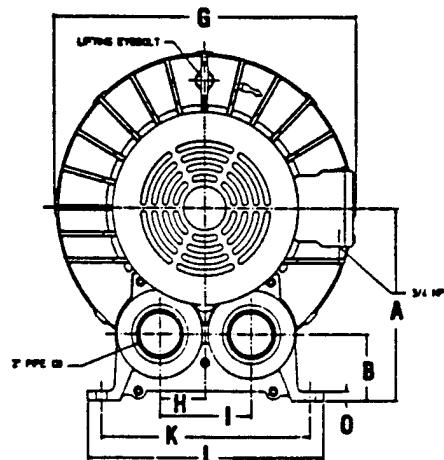
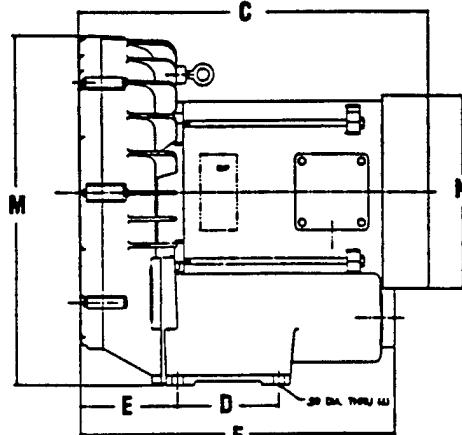
Product Dimensions Metric (mm) U.S. Imperial (inches)

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
R4110N-50	157	43	360	95	72	316	313	50	101	225	227	254	293	175	11
	6.18	1.68	14.16	3.75	2.85	12.44	12.31	1.98	3.96	8.86	8.93	10.00	11.73	6.88	.44
R4310P-50	157	43	360	95	72	316	313	50	101	225	227	254	293	175	11
	6.18	1.68	14.17	3.75	2.84	12.44	12.31	1.98	3.96	8.86	8.93	10.00	11.73	6.88	.44
RS325R-50	178	46	423	114	91	361	344	60	121	260	262	298	350	183	15
	7.00	1.82	16.66	4.50	3.58	14.22	13.56	2.38	4.75	10.25	10.31	11.75	13.78	7.19	.59
R6P355R-50	248	80	482	140	137	438	428	64	127	-	290	325	463	257	13
	9.77	3.15	18.98	5.51	5.39	17.25	16.87	2.50	5.00	-	11.42	12.80	18.21	10.12	.59

Model R4 Series
Model R5 Series

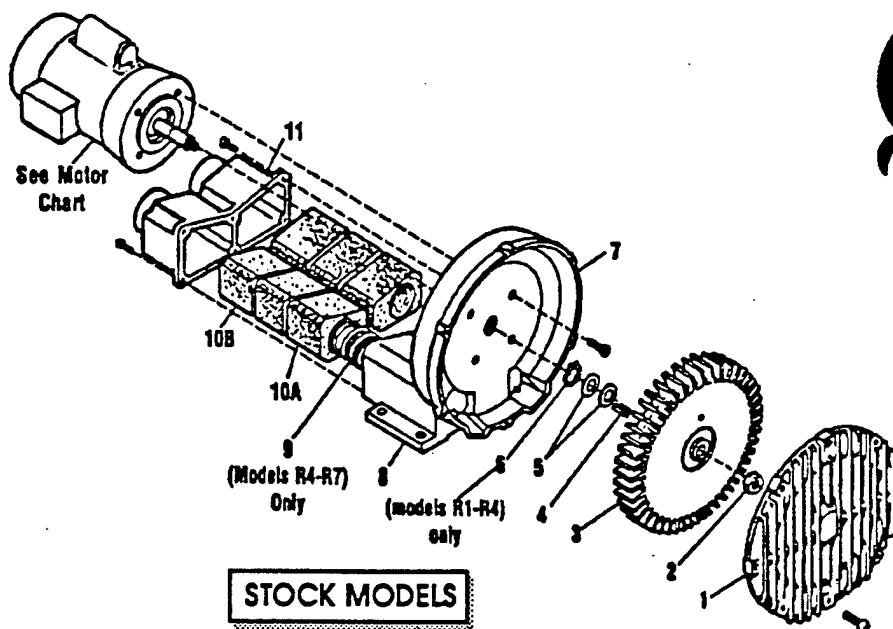


Model R6P Series



NOTE: These units with explosion-proof motors are designed specifically for qualified OEMs in the soil remediation industry. They are not intended to be applied for other uses without written acknowledgement from an authorized employee of Gast Manufacturing Corporation.

1st
Q



Part Name	R1	R2	R3	R4	R5	R6	R6P	R6PP/R6PS	R7
#1 Cover	AJ101A	AJ101B	AJ101C	AJ101D	AJ101EQ	AJ101F	AJ101K	(2)AJ101KA	AJ101G
#2 Stopnut	BC187	BC187	BC181	BC181	BC181	BC181	BC181	(2)BC182	BC183
#3 Impeller	AJ102A	AJ102BQ	AJ102C	AJ102D	AJ102E	AJ102FR	AJ102K	(2)AJ102KA	AJ102GA
#4 Square Key	AH212C	AH212	AB136A	AB136D	AB136	AB136	AB136	(2)AB136	AC628
#5 Shim Spacer (s)	AJ132	AE686-3	AJ109	AJ109	AJ109	AJ116A	AJ116A	AJ116A	AJ110
#6 Retaining Ring	AJ145	AJ145	AJ149	AJ149					
#7 Housing	AJ103A	AJ103BQ	AJ103C	AJ103DR	AJ103E	AJ103F	AJ103K	AJ103KD	AJ103GA
#8 Muffler Box					AJ104E	AJ104F			
#9 Spring				AJ113DR	AJ113DQ	AJ113FQ	AJ113FQ		AJ113G
#10A Foam	(4)AJ112A	(4)AJ112B	(4)AJ112C	(4)AJ112DS	(4)AJ112ER	(6)AJ112F	(8)AJ112K		(8)AJ112GA
#10B Foam	(2)AJ112BQ	(2)AJ112CQ	(2)AJ112DR		(2)AJ112EQ				
#11 Muffler Extension/ Adapter Plate	AJ106H	AJ106BQ	AJ106CQ	AJ106DQ	AJ106EQ	AJ106FQ	AJ104K		AJ104GA
Shim Kit	K396	K396							K395

MOTOR CHART

REGENAIR MODEL NUMBER	MOTOR NUMBER	MOTOR SPECIFICATIONS		
		60 HZ VOLTS	50 HZ VOLTS	PHASE
R1102	J111X	115/208-230	110/220-240	1
R1102C	J112X	115		1
R2103	J311X	115/208-230	110/220	1
R2105	J411X	115/208-230	110/220	1
R2303A	J310	208-230/460	220/380-415	3
R2303F	J313	208-230	220	3
R3105-1/R3105-12	J411X	115/208-230	110/220-240	1
R3305A-1/R3305A-13	J410	208-230/460	220/380-415	3
R4110-2	J611AX	115/208-230	110/220-240	1
R4310A-2	J610	208-230/460	220/380-415	3
R5125-2	J811X	115/208-230		1
R5325A-2	J810X	208-230/460	220/380-415	3
R6125-2	J811X	115/208-230		1
R6325A-2	J810X	208-230/460	220/380-415	3
R6335A-2	J910X	208-230/460	220/380-415	3
R6150J-2	J1013	230		1
R6350A-2	J1010	208-230/460	220/380-415	3
R6P335A	J910X	208-230/460	220/380-415	3
R6P350A	J1010	208-230/460	220/380-415	3
R6P355A	J1110A	208-230/460	220/380-415	3
R71DQA-2*	J1210B	208-230/460	220/380-415	3
R6PP/R6PS3110M	JD1100	208-230/460	220/380-415	

* No lubrication needed at start up.
Bearings lubricated at factory.

* Motor is equipped with alemite fitting.
Clean tip of fitting and apply grease gun.
Use 1 to 2 strokes of high quality ball
bearing grease.

Consistency	Type	Typical Grease
Medium	Lithium	Shell Dolium R

Hours of service per year	Suggested Re-lube Interval
------------------------------	-------------------------------

5,000 3 years

Continual Normal Application 1 year

Seasonal service motor
idle for 6 months or more 1 year beginning
of season
6 months

Continuous-high ambient,
dirty or moist applications.

60 HZ FLOW DATA (CFM)

All performance figures relate to stock models. A few high pressure units may be available. Consult your local distributor.

Regenair Model Number	P R E S S U R E					Maximum Pressure "H ₂ O"
	0" H ₂ O	20" H ₂ O	40" H ₂ O	60" H ₂ O	80" H ₂ O	100" H ₂ O
R1	26	14				28
R2	42	26				38
R3105-1	52	38	14			42
R3105-12	52	36	23			55
R3305A-13	52	36	23			55
R4	93	70	50			52
R5	145	130	100			65
R6125-2	200	180				35
R6325A-2	200	180	152			40
R6335A-2	205	175	155	135		70
R6350A-2	200	180	150	130	110	80
R6P335A	290	250				30
R6P350A	300	260	230	200		60
R6P355A	300	260	230	200	160	90
R7100A-2	420	380	340	310	280	230
R6PP311OM	485	452	420	380	330	95
R6PS311OM	265	258	252	244	236	226
						170

Regenair Model Number	V A C U U M					Maximum Vacuum "H ₂ O"
	0" H ₂ O	20" H ₂ O	40" H ₂ O	60" H ₂ O	80" H ₂ O	
R1	25	14				26
R2	40	22				34
R3105-1	50	34	9			40
R3105-12	51	34	20			50
R3305A-13	51	34	20			50
R4	82	62	39			48
R5	140	115	90	50		60
R6125-2	190	155	125			45
R6325A-2	190	155	125			45
R6335A-2	190	150	125	100		75
R6350A-2	190	180	150	100	70	90
R6P335A	270	230				37
R6P350A	280	240	210	170		70
R6P355A	280	240	210	170	100	86
R7100A-2	410	350	300	250	170	90
R6PP311OM	470	425	375	320	220	80
R6PS311OM	240	225	210	195	175	130

*This number indicates the maximum static pressure differential recommended (with cooling air still flowing through unit). In general, units 1hp or less can be dead headed. Check with local representative or distributor to verify which models apply.

Operation of the blower above the recommended maximum duty will cause premature failure due to the build up of heat damaging the components.

Performance data was determined under the following conditions:

- 1) Unit in a temperature stable condition.
- 2) Test conditions: Inlet air density at 0.075lbs. per cubic foot. (20°C(68°F), 29.92 in. Hg(14.7PSIA)).
- 3) Normal performance variations on the resistance curve within +/- 10% of supplied data can be expected.
- 4) Specifications subject to change without notice.
- 5) All performance at 60Hz operation.



70-6100
F2-205/8/92
AK811 Rev. E

Post Office Box 97
Benton Harbor, MI. 49023-0097
Ph: 616/926-6171
Fax: 616/925-8288

INSTALLATION AND OPERATING INSTRUCTIONS FOR GAST HAZARDOUS DUTY REGENAIR BLOWERS

This instruction applies to the following
models ONLY: **R3105N-50, R4110N-50,
R4310P-50, R4P115N-50, R5125Q-50,
R5325R-50, R6130Q-50, R6P155Q-50,
R6350R-50, R6P355R-50 and R7100R-50.**

Gast Authorized Service Facilities are Located in the locations listed below

Gast Manufacturing Corporation
505 Washington Avenue
Carlstadt, N. J. 07072
Ph: 201/933-8484
Fax: 201/933-5545

Gast Manufacturing Corporation
2550 Meadowbrook Road
Benton Harbor, MI. 49022
Ph: 616/926-6171
Fax: 616/925-8288

Brenner Fiedler & Associates
13824 Bentley Place
Cerritos, CA. 90701
Ph: 213/404-2721
Ph: 800/843-5558
Fax: 213/404-7975

Wainbee Limited
215 Brunswick Blvd.
Pointe Claire, Quebec
Canada H9R 4R7
Ph: 514/697-8810
Fax: 514/697-3070

Wainbee Limited
5789 Coopers Ave.
Mississauga, Ontario
Canada L4Z 3S6
Ph: 416/243-1900
Fax: 416/243-2336

Japan Machinery
Central PO Box 1451
Tokyo 100-91, Japan
Ph: 813 3573-5421
Fax: 813 3571-7896

Gast Manufacturing Co. Ltd.
Halifax Road, Cressex Estate
High Wycombe, Bucks HP12 3SN
England
Ph: 44 494 523571
Fax: 44 494 436588

Safety

⚠ This is the safety alert symbol. When you see this symbol, personal injury is possible. The degree of injury is shown by the following signal words:

⚠ DANGER: Severe injury or death will occur if hazard is ignored.

⚠ WARNING: Severe injury or death can occur if hazard is ignored.

⚠ CAUTION: Minor injury or property damage can occur if hazard is ignored.

Review the following information carefully before operating.

General Information

⚠ DANGER: Do not pump flammable or explosive gases or operate in an atmosphere containing them. Ambient temperature for normal operation should not exceed 40 degrees C (105 degrees F). For higher ambient operation, consult the factory. Blower performance is reduced by the lower atmospheric pressure of high altitudes. If it applies to this unit, consult a Gast distributor or the factory for details.

⚠ WARNING: Electric Shock can result from bad wiring. Wiring must conform to all required safety codes and be installed by a qualified person.

Grounding is required.

The Gast Regenair blower can be installed in any position. The flow of cooling air over the blower and motor must not be blocked.

PLUMBING - The threaded pipe ports are designed as connection ports only and will not support the plumbing. Be sure to use the same or larger size pipe and fittings to prevent air flow restriction and over-heating of the blower. When installing plumbing, be sure to use a small amount of pipe thread lubricant. This protects the threads in the aluminum blower housing. Dirt and chips, often found in new plumbing, should not be allowed to enter the blower.

NOISE - To reduce noise and vibration, the unit should be mounted on a solid surface that will not increase sound. The use of shock mounts or vibration isolation material is recommended. If needed, inlet or discharge noise can be reduced by attaching muffler assemblies (see accessories).

ROTATION - The Gast Regenair blower should only rotate clockwise as viewed from the electric motor side. This is marked with an arrow in the casting. Proper rotation can be confirmed by checking air flow at the IN and OUT ports. On blowers powered by a three phase motor, rotation is reversed by changing any two of the three power wires.

Operation

⚠ WARNING: Solid or liquid material exiting the blower or piping can cause eye damage or skin cuts. Keep away from air stream.

⚠ CAUTION: Attach blower to solid surface before starting. Prevent injury or damage from unit movement.

Air containing solid particles or liquid must pass through a filter before entering the blower (see accessories list for filter suggestions). Blowers must have mufflers, filters, other accessories and all piping attached before starting. Any foreign material passing through the blower may cause internal damage.

⚠ CAUTION: Outlet piping can burn skin. Guard or limit access.

Mark "CAUTION Hot surface. Can cause burns."

Air temperature increases when passing through the blower. When run at duties above 50 in. H₂O, metal pipe may be required for hot exhaust air.

The blower must not be operated above the limits for continuous duty. "Standard" R1, R2, R3 and R4 can operate continuously with no air flowing through the blower. Other units can only be run at the rating shown on the model number label. Do not close off inlet (for vacuum) or exhaust (for pressure) to reduce extra air flow. This could cause added heat and motor load.

ACCESSORIES - Gast pressure gauges AJ496 or AE133 and vacuum gauges AJ497 or AE134 show blower duty. The Gast pressure/vacuum relief valve, AG258, will limit the operating duty by admitting or relieving air. It also allows full flow through the blower when the relief valve closes.

Servicing

⚠ WARNING: Disconnect electric power before servicing. Be sure rotating parts have stopped. Electric shock or severe cuts can result. Inlet and exhaust filters need occasional cleaning or replacement of the elements. Failure to do so will result in more pressure drop, reduced air flow and hotter operation. The outside of the unit requires cleaning of dust and dirt. The inside of the blower also may need cleaning to remove material coating the impeller and housing. If not done, the buildup can cause vibration, hotter operation and reduced flow. Noise absorbing foam in the mufflers may need replacement.

KEEP THIS INFORMATION WITH THE BLOWER. REFER TO IT FOR SAFE INSTALLATION, OPERATION OR SERVICE.

TROUBLESHOOTING		
Symptom	Possible Diagnosis	Possible Remedy
Excess vibration	Impeller damaged by foreign material Impeller contaminated by foreign material	Replace impeller Clean impeller, install adequate filtration.
Abnormal sound	Motor bearing failed Impeller rubbing against cover or housing	Replace bearings Repair blower, check clearances.
Increase in sound	Foreign material can coat or destroy muffler foam.	Replace foam muffler elements, trap or filter foreign material.
Blown fuse	Electrical wiring problem	Have qualified person check fuse capacity and wiring.
Unit very hot	Running at too high a pressure or vacuum	Install a relief valve.

OPERATING AND MAINTENANCE INSTRUCTIONS

SAFETY

This is the safety alert symbol. When you see this symbol personal injury is possible. The degree of injury is shown by the following signal words:

DANGER Severe injury or death will occur if hazard is ignored.

WARNING Severe injury or death can occur if hazard is ignored.

CAUTION Minor injury or property damage can occur if hazard is ignored.

Review the following information carefully before operating.

GENERAL INFORMATION

This instruction applies to the following models ONLY: R3105N-50, R4110N-50, R4310P-50, R4P115N-50, R5125Q-50, R5325R-50, R6130Q-50, R6P155Q-50, R6350R-50, R6P355R-50 and R7100R-50. These blowers are intended for use in Soil Vapor Extraction Systems. The blowers are sealed at the factory for very low leakage. They are powered with a U.L. listed electric motor Class 1 Div. 1 Group D motors for Hazardous Duty locations. Ambient temperature for normal full load operation should not exceed 40° C (105° F). For higher ambient operation, contact the factory.

Gast Manufacturing Corporation may offer general application guidance; however, suitability of the particular blower and/or accessories is ultimately the responsibility of the user, not the manufacturer of the blower.

INSTALLATION

DANGER Models R5325R-50, R6130Q-50, R6350R-50, R5125Q-50, R6P155Q-50, R6P355R-50 AND R7100R-50 use Pilot Duty Thermal Overload Protection. Connecting this protection to the proper control circuitry is mandated by UL674 and NEC501. Failure to do so could/may result in a EXPLOSION. See pages 3 and 4 for recommended wiring schematic for these models.

WARNING Electric shock can result from bad wiring. A qualified person must install all wiring, conforming to all required safety codes. Grounding is necessary.

WARNING This blower is intended for use on soil vapor extraction equipment. Any other use must be approved in writing by Gast Manufacturing Corp. Install this blower in any mounting position. Do not block the flow of cooling air over the blower and motor.

PLUMBING - Use the threaded pipe ports for connection only. They will not support the plumbing. Be sure to use the same or larger size pipe to prevent air flow restriction and overheating of the blower. When installing fittings, be sure to use pipe thread sealant. This protects the threads in the blower housing and prevents leakage. Dirt and chips are often found in new plumbing. Do not allow them to enter the blower.

NOISE - Mount the unit on a solid surface that will not increase the sound. This will reduce noise and vibration. We suggest the use of shock mounts or vibration isolation material for mounting.

ROTATION - The Gast Regenair Blower should only rotate clockwise as viewed from the electric motor side. The casting has an arrow showing the correct direction. Confirm the proper rotation by checking air flow at the IN and OUT ports. If needed reverse rotation of three phase motors by changing the position of any two of the power line wires.

OPERATION

WARNING Solid or liquid material exiting the blower or piping can cause eye damage or skin cuts. Keep away from air stream.

WARNING - Gast Manufacturing Corporation will not knowingly specify, design or build any blower for installation in a hazardous, combustible or explosive location without a motor conforming to the proper NEMA or U.L. standards. Blowers with standard TEFC motors should never be utilized for soil vapor extraction applications or where local state and/or Federal codes specify the use of explosion-proof motors (as defined by the National Electric Code, Articles 100,500 c1990).

CAUTION Attach blower to solid surface before starting to prevent injury or damage from unit movement. Air containing solid particles or liquid must pass through a filter before entering the blower. Blowers must have filters, other accessories and all piping attached before starting. Any foreign material passing through the blower may cause internal damage to the blower.

CAUTION Outlet piping can burn skin. Guard or limit access. Mark "CAUTION Hot Surface. Can Cause Burns". Air temperature increases when passing through the blower. When run at duties above 50 in. H₂O metal pipe may be required for hot exhaust air. The blower must not be operated above the limits for continuous duty. Only models R3105N-50, R4110N-50 and R4310P-50 can be operated continuously with no air flowing through the blower. Other units can only be run at the rating shown on the model number label. Do not Close off inlet (for vacuum) to reduce extra air flow. This will cause added heat and motor load. Blower exhaust air in excess of 230°F indicates operation in excess of rating which can cause the blower to fail.

ACCESSORIES ...Gast pressure gauge AJ496 and vacuum gauges AJ497 or AE134 show blower duty. The Gast pressure/vacuum relief valve, AG258, will limit the operating duty by admitting or relieving air. It also allows full flow through the blower when the relief valve closes.

SERVICING

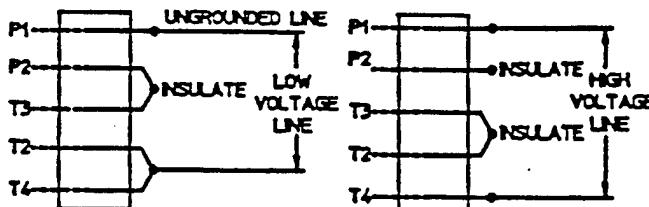
⚠ WARNING To retain their sealed construction they should be serviced by Gast authorized service centers ONLY. These models are sealed at the factory for very low leakage.

⚠ WARNING Turn off electric power before removing blower from service. Be sure rotating parts have stopped. Electric shock or severe cuts can result. Inlet and exhaust filters attached to the blower may need cleaning or replacement of the elements. Failure to do so will result in more pressure drop, reduced air flow and hotter opera-

tion of the blower. The outside of the unit requires cleaning of dust and dirt. The inside of the blower also may need cleaning to remove foreign material coating the impeller and housing. This should be done at a Gast Authorized Service Center. This buildup can cause vibration, failure of the motor to operate or reduced flow.

**KEEP THIS INFORMATION WITH THIS BLOWER.
REFER TO IT FOR SAFE INSTALLATION,
OPERATION OR SERVICE.**

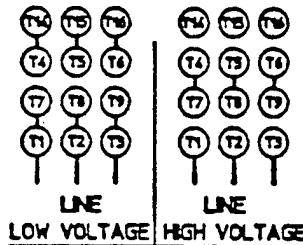
MOTOR WIRING DIAGRAM FOR R4110N-50 & R3105N-50



>>> WARNING
THIS MOTOR IS THERMALLY PROTECTED AND WILL AUTOMATICALLY RESTART WHEN PROTECTOR RESETS. ALWAYS DISCONNECT POWER SUPPLY BEFORE SERVICING.

MOTORS WIRING DIAGRAM FOR R4310P-50

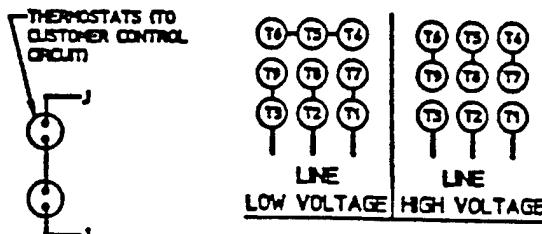
TO REVERSE ROTATION,
INTERCHANGE THE
EXTERNAL CONNECTIONS
TO ANY TWO LEADS.



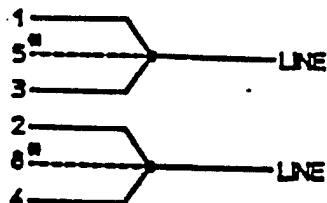
>>> WARNING
THIS MOTOR IS THERMALLY PROTECTED AND WILL AUTOMATICALLY RESTART WHEN PROTECTOR RESETS. ALWAYS DISCONNECT POWER SUPPLY BEFORE SERVICING.

MOTORS WIRING DIAGRAM FOR R5325R-50, R6350R-50, R6P355R-50, & R7100R-50

TO REVERSE ROTATION,
INTERCHANGE THE
EXTERNAL CONNECTIONS
TO ANY TWO LEADS.

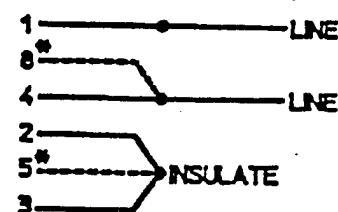


MOTOR WIRING DIAGRAM FOR R5125Q-50 & R4P115N-50



— THERMOSTAT
— THERMOSTAT

LOW VOLTAGE

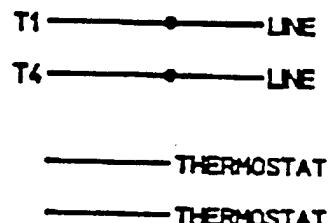


HIGH VOLTAGE

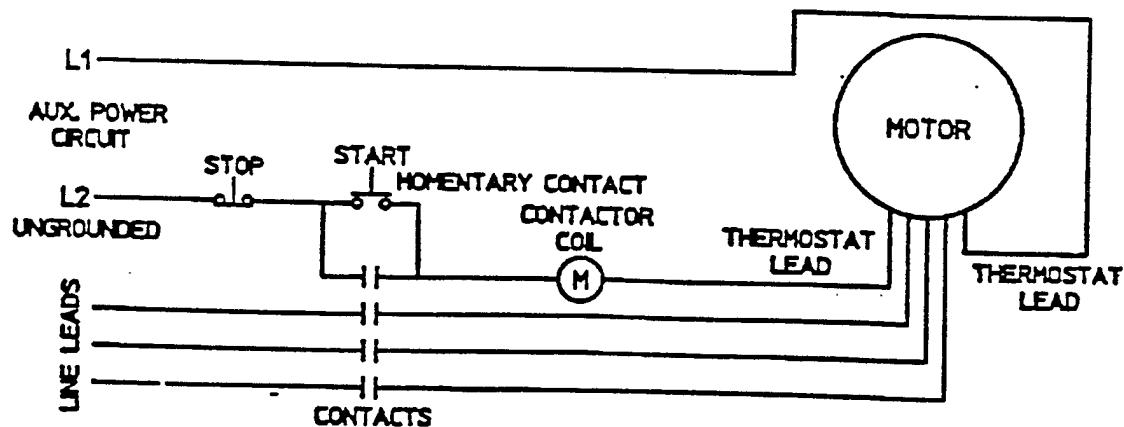
• R5125Q-50 BLOWERS PRODUCED AFTER SEPTEMBER 1992 (SER. NO. 0992)
DO NOT HAVE MOTOR LEADS 5 & 8.

MOTOR WIRING DIAGRAM FOR R6130Q-50 & R6P155Q-50

CONNECT THERMOSTAT
TO MOTOR PROTECTION
CIRCUIT



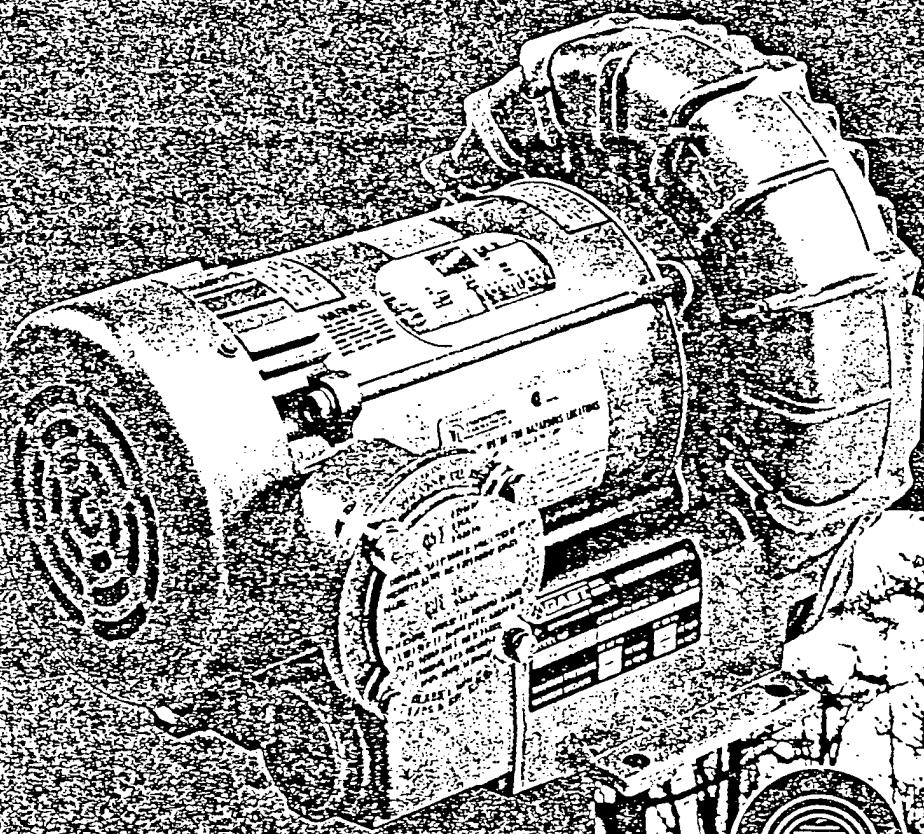
CONNECTION FOR THERMOSTAT MOTOR PROTECTION



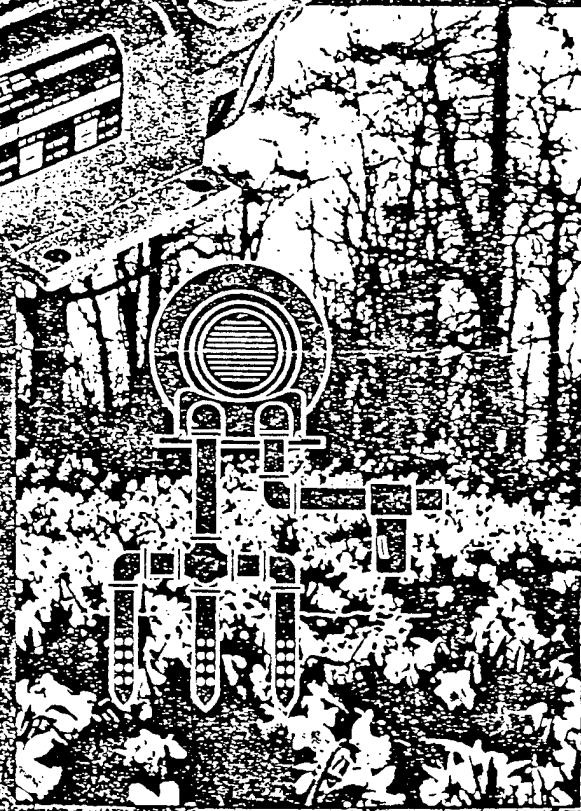
TERMOSTATS TO BE CONNECTED IN SERIES WITH
CONTROL AS SHOWN. MOTOR FURNISHED WITH
AUTOMATIC THERMOSTATS RATED A.C. 115-600V. 720VA

B l o w e r s f o r

SOIL VAPOR EXTRACTION



 **GAST.**



Your Warranty

REGARDLESS OF CAUSE, if a product you buy from this catalog does not work right, Gast will repair or replace it once, at no charge, for up to one year from the date of shipment from the factory.

In the course of repair or replacement, Gast may send you written recommendations on how to prevent a problem from happening again. Gast reserves the right to withdraw this warranty if you do not follow these recommendations. Customer is responsible for freight charges both to and from Gast in all cases.

THIS WARRANTY DOES NOT APPLY TO ELECTRIC MOTORS, ELECTRICAL CONTROLS AND GASOLINE ENGINES, WHICH GAST OBTAINS FROM OTHER MANUFACTURERS. A MOTOR OR ENGINE CARRIES ONLY THE WARRANTY OF THE COMPANY THAT MAKES IT. THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY AND OF FITNESS FOR ANY PARTICULAR PURPOSE. GAST'S LIABILITY IS IN ALL CASES LIMITED TO THE REPLACEMENT PRICE OF ITS PRODUCT. GAST SHALL NOT BE LIABLE FOR ANY OTHER DAMAGES, WHETHER CONSEQUENTIAL, INDIRECT, OR INCIDENTAL, ARISING FROM THE SALE OR USE OF ITS PRODUCTS.

Gast's sales personnel may modify this warranty, but only by signing a specific, written description of any modifications.

Gast Manufacturing Corporation

Customer Sales & Service

2550 Meadowbrook Road
Benton Harbor, MI 49022
Ph: 616/926-6171
Fax: 616/925-8288

Corporate Headquarters

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Carlstadt, NJ 07072
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Fax: 201/933-5545

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Wood Dale, IL 60191
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Fax: 708/860-1748

European Sales Office

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High Wycombe, Bucks HP 12 3SN
Ph: 44 494 523571
Fax: 44 494 436588
Telex 83488



Printed on recycled paper

GAST REGENAIR® Blowers

FOR SOIL VAPOR

designed to supply up to
420 cfm (714m³/hr),
7 in Hg/224 mbar (90" H₂O) or
4 psi/249 mbar (100" H₂O)

The Gast reputation for quality and customer satisfaction is renowned throughout the world. Since 1921 we have been supplying air moving products that have set the industry standard of excellence. Our regenerative blowers for soil vapor extraction are no exception. Designed to extract vapors from contaminated soils, these models are used in conjunction with site-supplied special filters which clean the contaminants before venting them to the atmosphere. Since this process can take months or even years, Gast environmental blowers are a perfect solution; the only wearing part is the bearing, which is rated for up to 25,000 hours of service. Also, each of our motor-mounted models comes with a Class 1 Group D explosion-proof motor as a standard feature. Combining this quality with the strongest warranty in the business and a vast national and international distribution network providing product and technical support, we think you'll find our special Gast Regenair® blowers to be the right choice for your soil vapor extraction needs.

MODEL R4 SERIES

48" H₂O MAX. VAC., 51" H₂O MAX. PRESSURE
92 CFM OPEN FLOW

MODEL R5 SERIES

60" H₂O MAX. VAC., 65" H₂O MAX. PRESSURE
160 CFM OPEN FLOW

MODEL R6 SERIES

70" H₂O MAX. VAC., 75" H₂O MAX. PRESSURE
215 CFM OPEN FLOW

MODEL R6P SERIES

85" H₂O MAX. VAC., 100" H₂O MAX. PRESSURE
280 CFM OPEN FLOW

MODEL R7 SERIES

90" H₂O MAX. VAC., 90" H₂O MAX. PRESSURE
420 CFM OPEN FLOW

PRODUCT FEATURES

- Explosion-proof motors UL (class 1, group D)
- Sealed air stream
- Rugged construction
- Low maintenance

Product Dimensions

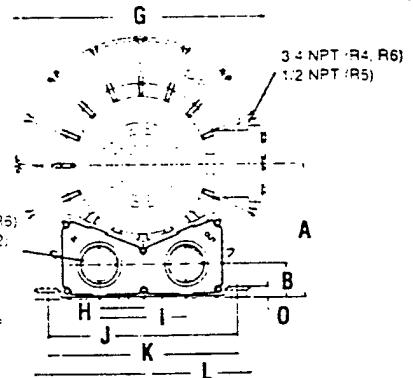
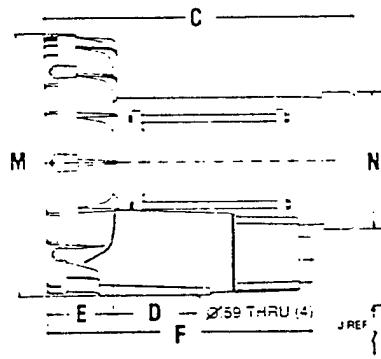
Model	Product Dimensions								Metric (mm)						U.S. Imperial (inches)					
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O					
R4110H-50	157	43	389	95	72	316	313	50	101	225	227	254	293	175	11					
	6.18	1.68	15.30	3.75	2.85	12.44	12.31	1.98	3.96	8.86	8.93	10.00	11.73	6.88	.44					
R4310P-50	157	43	356	95	72	316	313	50	101	225	227	254	293	175	11					
	6.18	1.68	14.03	3.75	2.84	12.44	12.31	1.98	3.96	8.86	8.93	10.00	11.73	6.88	.44					
R5125Q-50	178	46	445	114	91	361	344	60	121	260	262	298	350	173	15					
	7.00	1.82	17.50	4.50	3.58	14.22	13.56	2.38	4.75	10.25	10.31	11.75	13.78	6.81	.59					
R5325R-50	178	46	423	114	91	361	344	60	121	260	262	298	350	183	15					
	7.00	1.82	16.66	4.50	3.58	14.22	13.56	2.38	4.75	10.25	10.31	11.75	13.78	7.19	.59					
R6130Q-50	197	49	511	140	98	404	389	62	125	289	290	329	391	217	13					
	7.75	1.94	20.13	5.50	3.85	15.89	15.30	2.46	4.92	11.38	11.42	12.96	15.38	8.56	.52					
R6P1550Q-50	248	80	602	140	137	438	428	64	127	-	290	325	463	257	13					
	9.77	3.15	23.7	5.51	5.39	17.25	16.87	2.50	5.00	-	11.42	12.80	18.21	10.12	.50					
R6P355R-50	248	80	554	140	137	438	428	64	127	-	290	325	463	257	13					
	9.77	3.15	21.80	5.51	5.39	17.25	16.87	2.50	5.00	-	11.42	12.80	18.21	10.12	.50					
R7100R-50	274	92	577	216	212	545	457	100	200	-	375	410	509	257	14					
	10.79	3.64	22.72	8.50	8.33	21.46	18.00	3.94	7.88	-	14.76	16.14	20.02	10.12	.56					

Notice: Specifications subject to change without notice.

R4 Series

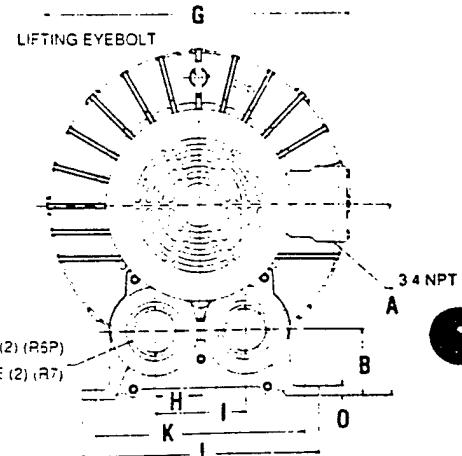
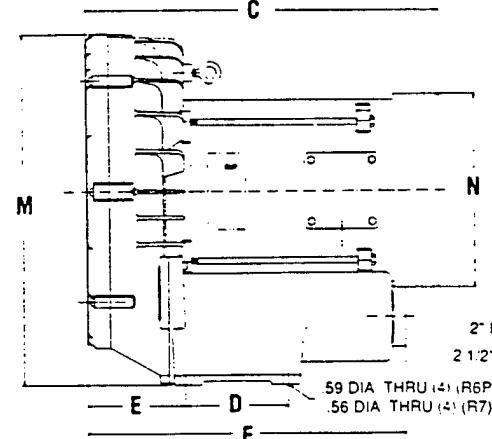
R5 Series

R6 Series



R6P Series

R7 Series



More models may be available – please consult factory

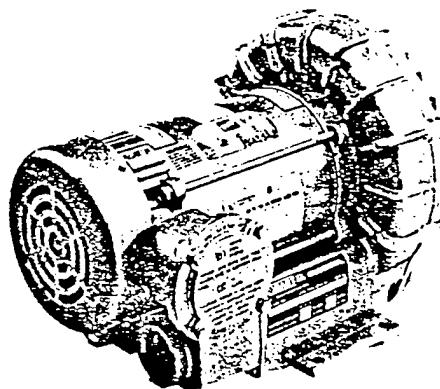
EXTRACTION. . .

Product Specifications

Model Number	Hz	Motor Specs	Full Load Amps	HP	RPM	Max Vac "H ₂ O mbar	Max Pressure "H ₂ O mbar	Max Flow cfm m ³ /h	Net Wt lbs.
R4110N-50	50	110/220-240-50-1*	9.2/5.2-4.6	0.6	2850	35	87	38 95	74 126
	60	115/208-230-60-1*	11.4/6.2-5.6	1.0	3450	48	120	51 127	92 156
R4310P-50	50	220/380-50-3*	3.2/1.6	0.6	2850	35	87	38 95	74 126
	60	208-230/460-60-3*	3.4-3.3/1.65	1.0	3450	48	120	51 127	92 156
R5125Q-50	60	115/230-60-1	25/12.5	2.0	3450	60	149	55 137	160 272
R5325R-50	50	190-220/380-415-50-3	5.0-4.4/2.5-2.6	1.5	2850	47	117	50 125	133 226
	60	208-230/460-60-3	6.0-5.6/2.8	2.0	3450	60	149	65 162	160 272
R6130Q-50	50	220-240-50-1	14.7-13.5	2.5	2850	65	162	75 187	182 309
	60	230-60-1	16.3	3.0	3450	70	174	60 149	215 365
R6P155Q-50	50	220-240-50-1	20.8-19.1	4.0	2850	65	162	80 199	235 399
	60	230-60-1	29.9	5.5	3450	85	212	95 237	280 476
R6P355R-50	50	190-220/380-415-50-3	14.9-11/7.45-5.8	4.5	2850	65	162	80 199	232 394
	60	208-230/460-60-3	20-18/9	6.0	3450	85	212	100 249	280 476
R7100R-50	50	190-220/380-415-50-3	20.8-18.9/10.4-9.5	8	2850	72	179	80 199	350 595
	60	208-230/460-60-3	26.5-24/12	10	3450	90	224	90 224	420 714

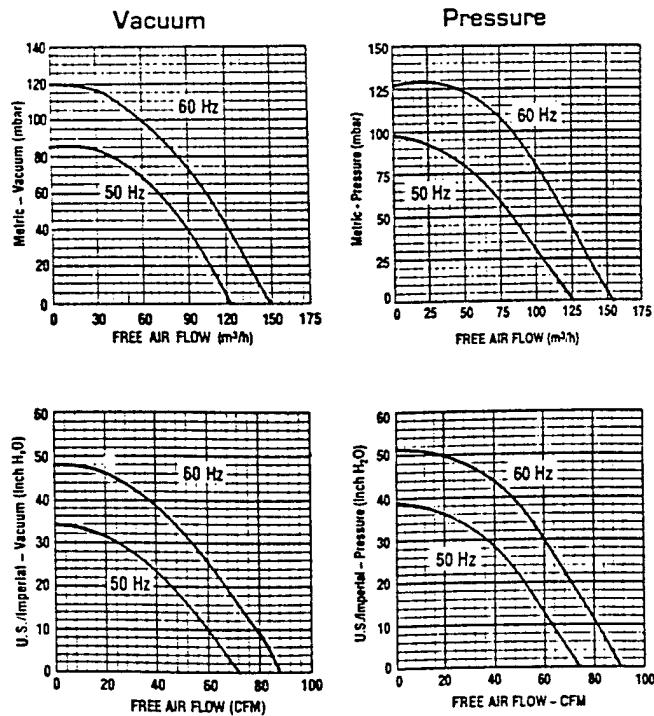
*Models have automatic reset thermal protection.

Product Performance (Metric/U.S. Imperial)

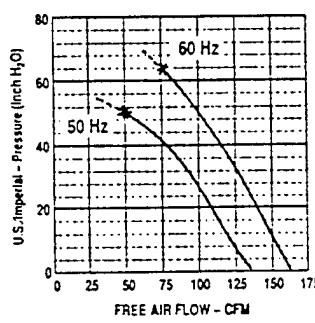
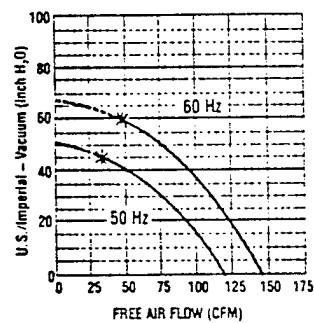
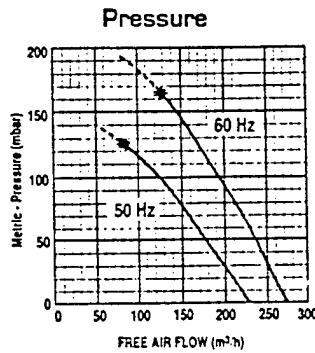
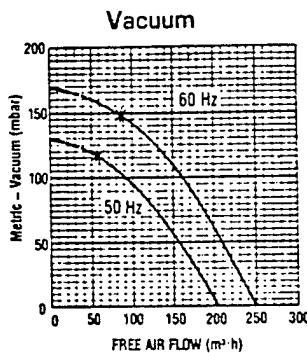


NOTE: These units with explosion-proof motors are designed specifically for qualified OEMs in the soil vapor extraction industry. They are not intended to be applied for other uses without written acknowledgment from an authorized employee of Gast Manufacturing Corporation.

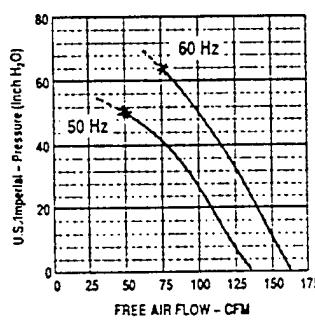
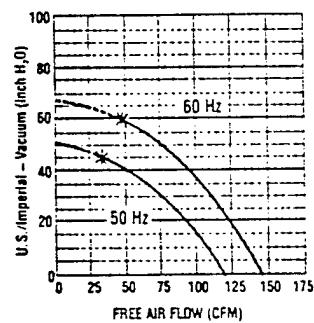
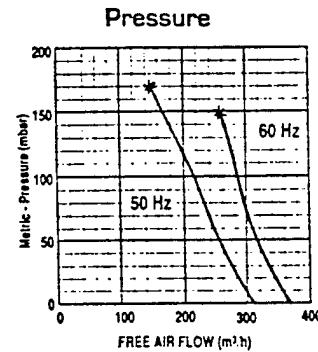
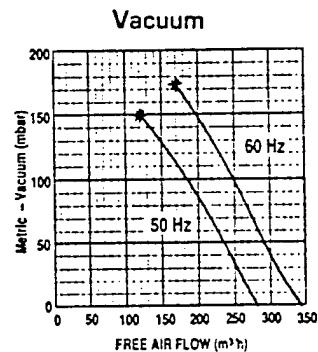
Model R4 Series



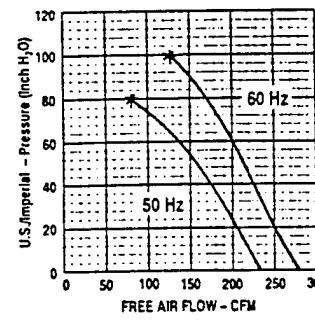
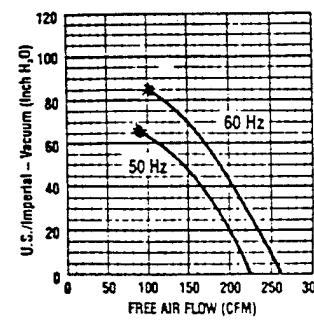
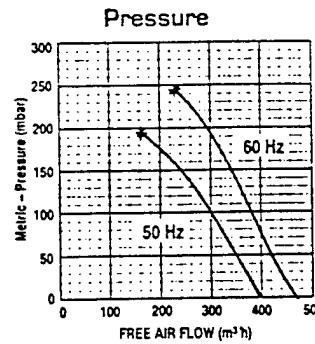
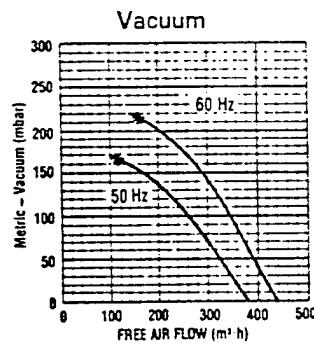
Model R5 Series



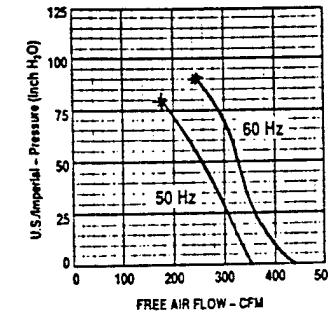
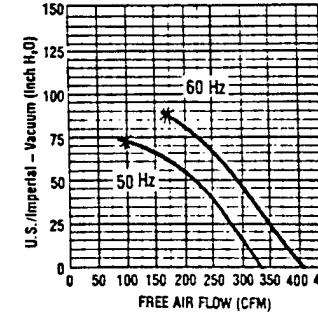
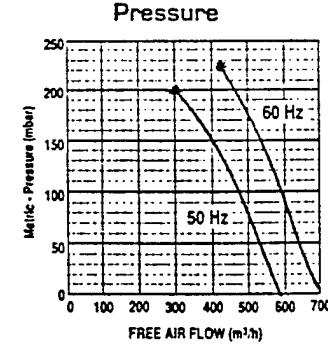
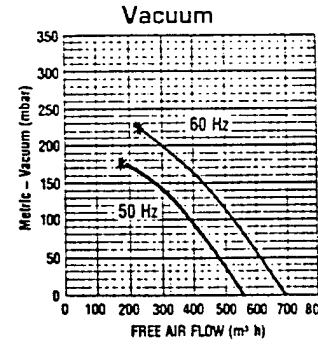
Model R6 Series



Model R6P Series



Model R7 Series



23SN

Blower Accessories

In-line Filters

The impeller of a blower passes very close to the housing. It is always wise to have an inlet or in-line filter to ensure troublefree life.



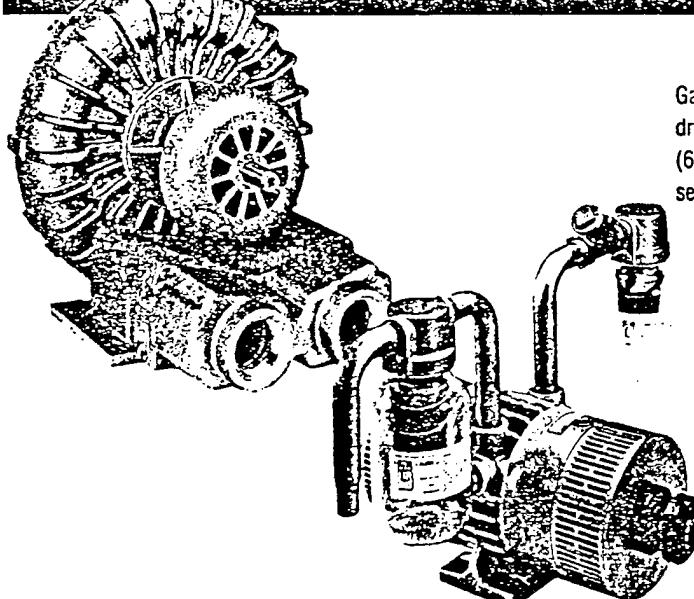
Model No.	R4	R5	R6,R6P	R7
Part No.	AJ151D	AJ151E	AJ151G	AJ151H
Replacement Element	AJ135E	AJ135F	AJ135G	AJ135C
Micron	10	10	10	10

Vacuum and Pressure Gauges

To monitor the system performance so as not to exceed maximum duties. Using two (one on each side of the filter) is a great way to know when the filter needs servicing.

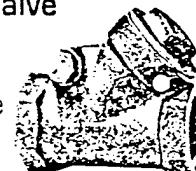


- Vacuum Gauge, Part #AJ497, 2 5/8" Dia., 1/4" NPT, 0-60 in. H₂O and 0-150 mbar
- Vacuum Gauge, Part #AE134, 2 5/8" Dia., 1/4" NPT, 0-160 in. H₂O and 0-400 mbar
- Pressure Gauge, Part #AJ496, 2 5/8" Dia., 1/4" NPT, 0-60 in. H₂O and 0-150 mbar
- Pressure Gauge, Part #AE133, 2 5/8" Dia., 1/4" NPT, 0-160 in. H₂O and 0-400 mbar
- Pressure Gauge, Part #AE133A, 2 5/8" Dia., 1/4" NPT, 0-200 in. H₂O



Horizontal Swing Type Check Valve

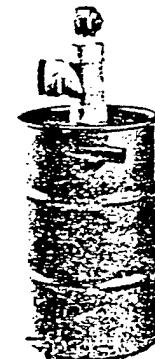
Designed to prevent back-wash of fluids that would enter the blower. Also prevents air back-streaming if needed. They can be mounted with their discharge either vertical or horizontal. Valve will open with 3" of water pressure.



Model No.	R4,R5	R6,R6P	R7
Part No.	AH326D	AH326F	AH326G
	1 1/2" NPT	2" NPT	2 1/2" NPT

Moisture Separator

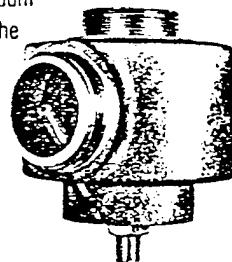
The purpose of the moisture separator is to remove liquids from the gas stream in a soil vapor extraction process. This helps protect the blower from corrosion and a build up of mineral deposits.



MODEL	LIQUID CAPACITY	
	GALLONS	USED ON
RMS160	10	R4, R4P, R5
RMS200	19	R4, R4P, R5, R6
RMS300	19	R5, R6, R6P
RMS400	40	R6P, R7

Relief Valve

By setting a relief valve at a given pressure/vacuum you can be assured that no harm will come to the blower or products in your application from excessive duties.



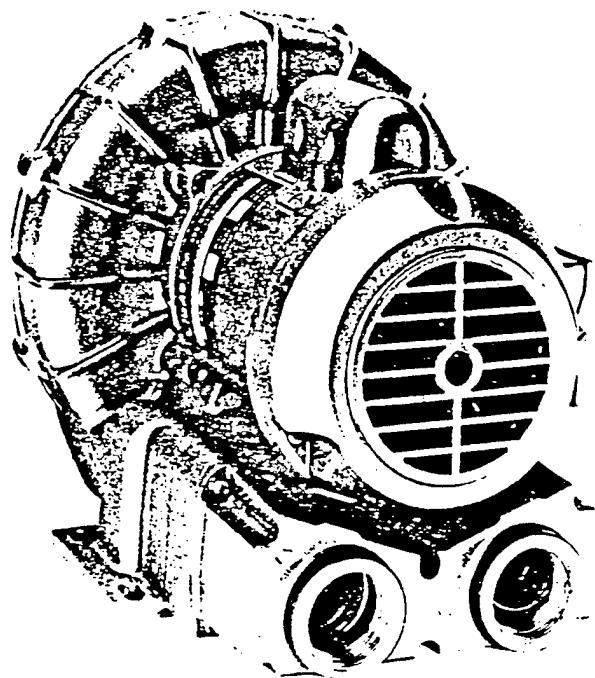
- Pressure/Vacuum Relief Valve, 1 1/2" NPT, Adjustable 30 - 170 in. H₂O, 200 cfm max. Part #AG258

Gast also offers other models that are ideal for soil sparging. Our separate drive blowers are available in 4 sizes to 15 hp, pressures to 170" H₂O (6 psi). Rotary vane compressors are available in motor mounted or separate drive styles up to 5 hp, pressures to 20 psi.

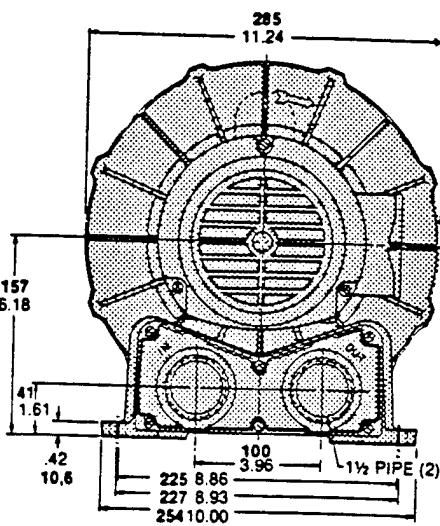
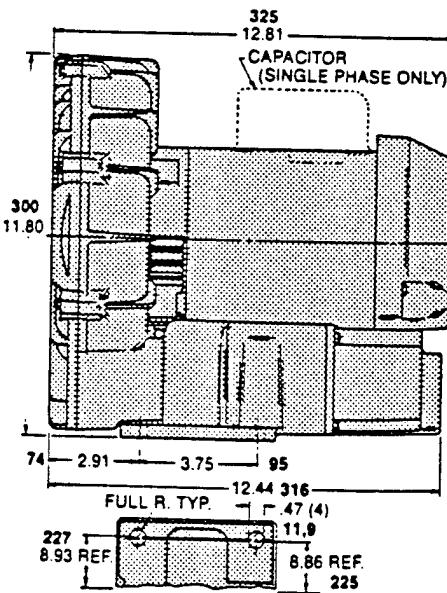
Oilless Regenerative Blowers, Motor Mounted to 92 cfm

GAST

REGENAIR® R4 Series



Product Dimensions Metric (mm) U.S. Imperial (inches)



MODEL R4110-2

52' H₂O MAX. PRESSURE, 92 CFM OPEN FLOW

PRODUCT FEATURES

- Oilless operation
- TEFC motor mounted
- Can be mounted in any plane
- Rugged construction/low maintenance
- Can be operated blanked-off

COMMON MOTOR OPTIONS

- 115/208-230V, 60 Hz; 110/220-240V, 50 Hz, single phase
- 208-230/460V, 60 Hz; 190-230/380-415V, 50 Hz, three phase
- 575V, 60 Hz, three phase

RECOMMENDED ACCESSORIES

- Pressure gauge AJ496
- Filter AG338
- Muffler AJ121D
- Relief valve AG258

Various brand name motors are used on any model at the discretion of Gast Mfg. Corp.

Important Notice:

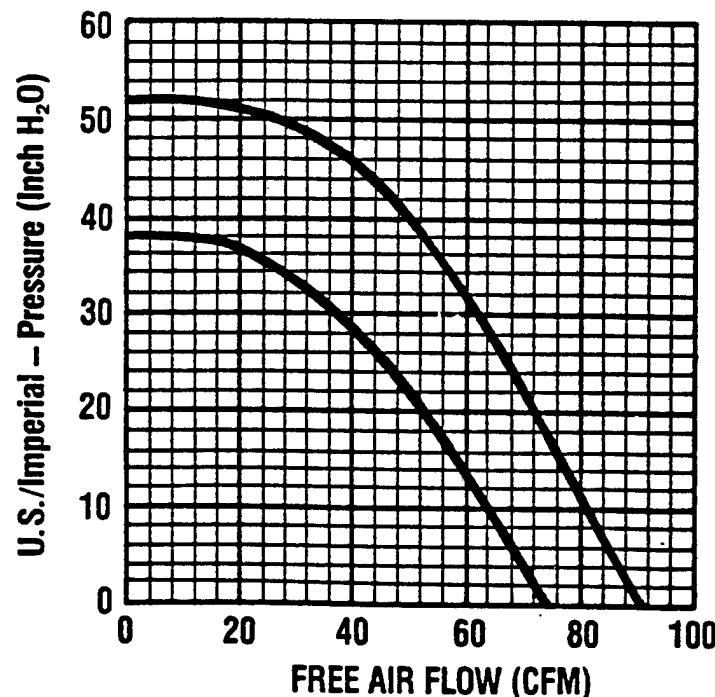
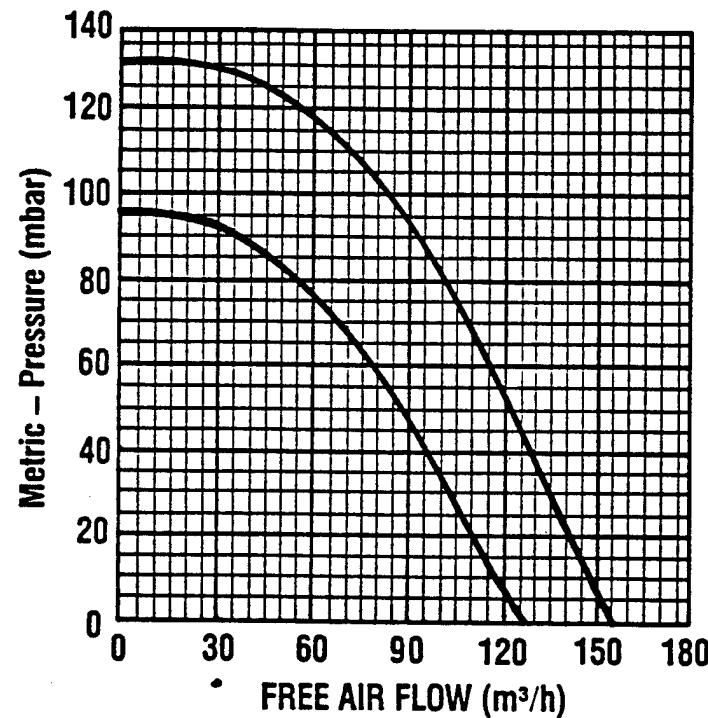
Pictorial and dimensional data is subject to change without notice.

Product Specifications

Model Number	Motor Specs	Full Load Amps	HP	RPM	Max Pressure "H ₂ O	mbar	Max Flow cfm	Max Flow m ³ /h	Net Wt. lbs.	Net Wt. kg
R4110-2	110/220-240-50-1	9.0/4.5-5.7	0.6	2850	38	95	74	126	41	18.6
	115/208-230-60-1	9.8/5.2-4.9	1.0	3450	52	130	92	156		
R4310A-2	190-220/380-415-50-3	2.6-3.3/1.3-1.4	0.6	2850	38	95	74	126	41	18.6
	208-230/460-60-3	3.4-3.2/1.6	1.0	3450	52	130	92	156		

Product Performance (Metric U.S. Imperial)

Black line on curve is for 60 cycle performance.
Blue line on curve is for 50 cycle performance.

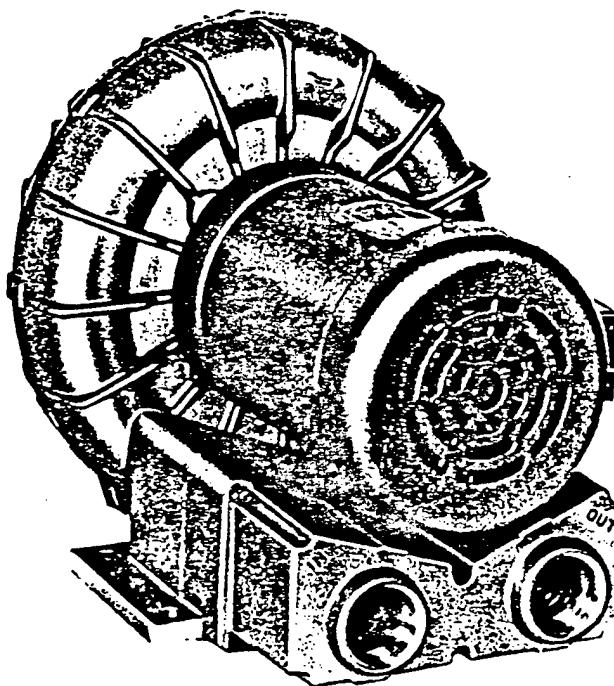


Oilless Regenerative Blowers, Motor Mounted to 160 cfm

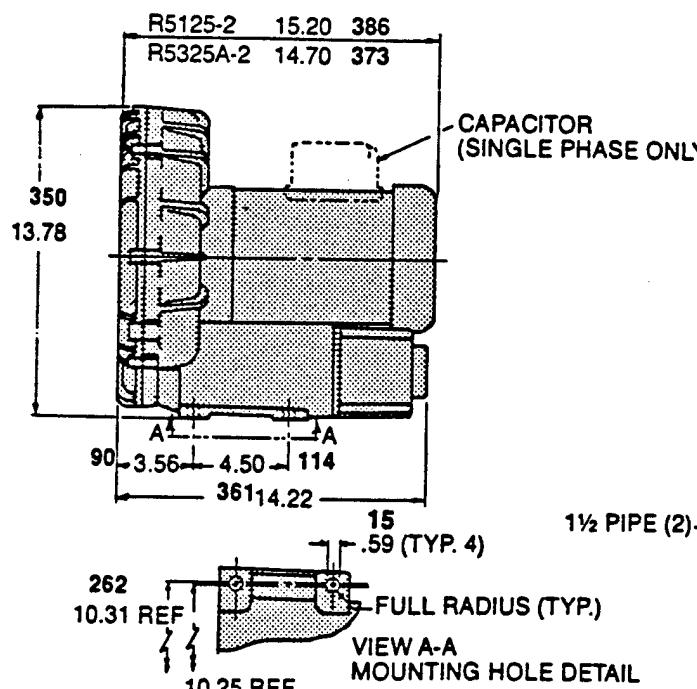


REGENAIR® R5 Series

PRESSURE



Product Dimensions Metric (mm) U.S. Imperial (inches)



MODEL R5325A-2
65" H₂O MAX. PRESSURE, 160 CFM OPEN FLOW

PRODUCT FEATURES

- Oilless operation
- TEFC motor mounted
- Can be mounted in any plane
- Rugged construction/low maintenance

COMMON MOTOR OPTIONS

- 115/208-230V, 60 Hz, single phase
- 208-230/460V, 60 Hz; 190-220/380-415V, 50 Hz, three phase
- 575V, 60 Hz, three phase

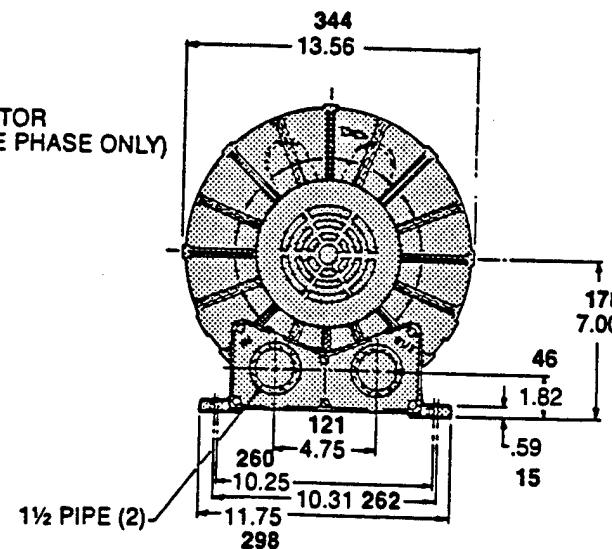
RECOMMENDED ACCESSORIES

- Pressure gauge AE133
- Filter AG338
- Muffler AJ121D
- Relief valve AG258

Various brand name motors are used on any model at the discretion of Gast Mfg. Corp.

Important Notice:

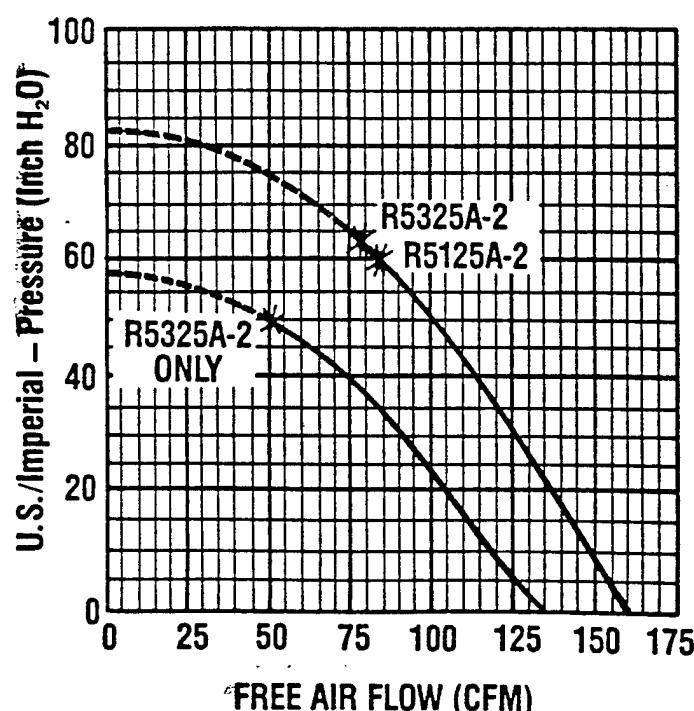
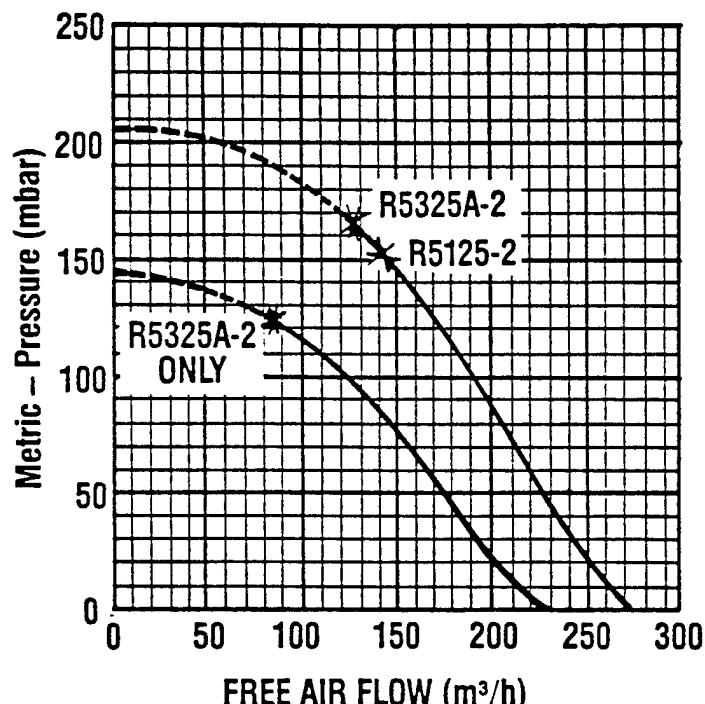
Pictorial and dimensional data is subject to change without notice.



Product Specifications

Model Number	Motor Specs	Full Load Amps	HP	RPM	Max Pressure "H ₂ O	mbar	Max Flow cfm	Max Flow m ³ /h	Net Wt. lbs.	Net Wt. kg
R5325A-2	190-220/380-415-50-3	6.6-6.7/3.3-3.5	1.35	2850	50	125	133	226	65	29.5
	208-230/460-3	6.9/3.45	2.5	3450	65	162	160	272		
R5125-2	115/208-230-60-1	22.4/12.4-11.2	2.5	3450	60	149	160	272	73	33.1

Product Performance (Metric U.S. Imperial) Black line on curve is for 60 cycle performance.
 Blue line on curve is for 50 cycle performance.



*Recommended maximum duty.

---- Intermittent duty only.

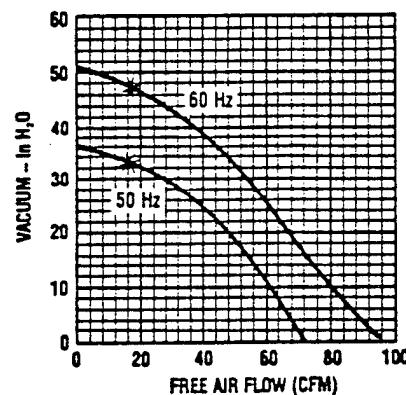
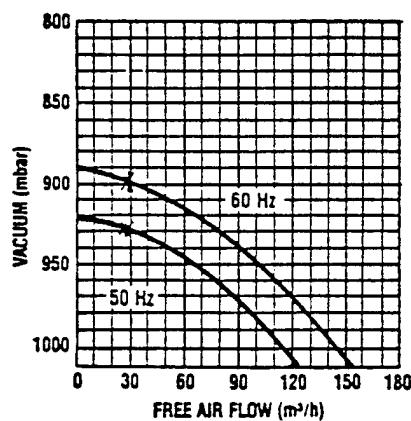
Product Specifications

Model Number	Hz	Motor Specs	HP	RPM	Max Vac "H ₂ O	mbar	Max Flow cfm	m ³ /h	Net Wt. lbs.	kg
R4110N-50	50	110/220-240-50-1	0.6	2850	35	924	72	122	60	28
	60	115/208-230-60-1	1.0	3450	48	895	88	150		
R4310P-50	50	220/380-50-3*	0.6	2850	35	924	72	122	58	27
	60	208-230/460-60-3*	1.0	3450	48	895	88	150		
R5125Q-50	60	115/230-60-1*	2.5	3450	60	865	145	246	77	35
R5325R-50	50	190-220/380-415-50-3*	1.85	2850	47	897	120	204	75	34
	60	208-230/460-60-3*	2.50	3450	60	865	145	246		
R6P355R-50	50	190-220/380-415-50-3*	4.5	2850	70	840	235	400	247	112
	60	208-230/460-60-3*	6.0	3450	90	790	260	442		

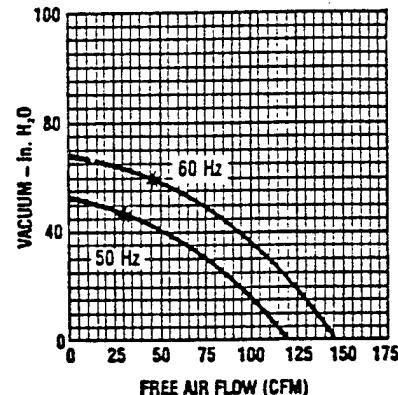
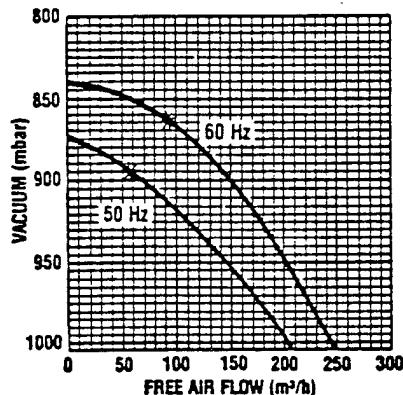
*Motors do not have thermal protection with automatic reset.

Product Performance (Metric U.S. Imperial)

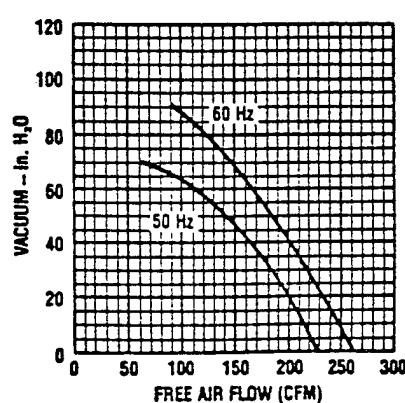
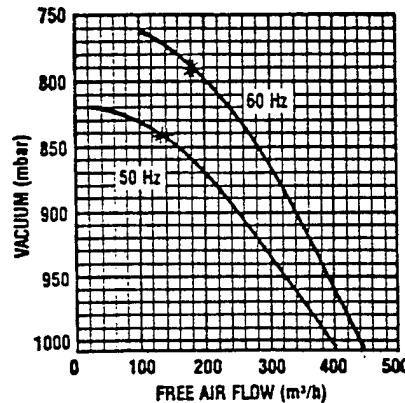
Model R4 Series



Model R5 Series



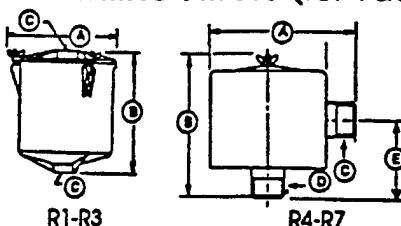
Model R6P Series



*Minimum flow permissible through the unit for trouble-free, continuous operation.

REGENAIR ACCESSORIES

Inline Filters (for vacuum)

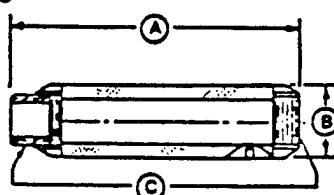


Model Number	R1 & R2	R3	R4, R5 & SDR4	R6 ^P SDR5, SDR6 R6PP, R6PS	R7
Part #	AV460	AV460C	AG337	AJ151G	AJ151H
Dim A	8.25"	8.25"	11.75"	8.00"	16.25"
Dim B	8.875"	8.875"	4.75"	10.25"	27.13"
Dim C	1" FPT	1 1/4" FPT	1 1/2" MPT	2 1/2" MPT	3" MPT
Dim D	-	-	1 1/2" FPT	2 1/2" MPT	3" MPT
Dim E	-	-	2.38	5.50	18.50
Replacement Element	AV469	AV469	AG340	AJ135G	AJ135C
Micron	10	10	25	10	10

MPT = Male Pipe Thread

FPT = Female Pipe Thread

Mufflers



Model Number	R2	R3	R4, R5 SDR 4" & SDR5"	R6, SDR6 ^P R6P R6PP, R6PS	R7
Part #	AJ121B	AJ121C	AJ121D	AJ121F	AJ121G
Dim. A	7.46"	7.94"	12.75"	17.05"	17.44"
Dim. B	2.38"	2.62"	3.25"	3.63"	4.25"
Dim. C	1" NPT	1 1/4" NPT	1 1/2" NPT	2" NPT	2 1/2" NPT

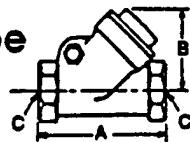
* For Inlet Only

** Approximately

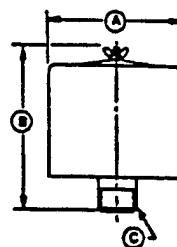
Fittings

Pipe Size	1"	1 1/4"	1 1/2"	2"	2 1/2"
Tee	BA415	BA431	BA432	BA433	BA434
Common Elbow	BA220	BA244	BA230	BA247	BA248
Nipple	BA752	BA809	BA783	BA810	BA813
Plastic Male Pipe Hose Barb	AJ117A	AJ117B	-	-	-
Hose I.D.	1.25	1.25	-	-	-
Metal Male Pipe Hose Barb	AJ117D	AJ117F	AJ117C	AJ117G	AJ117H
Hose I.D.	1.00	1.25	1.50	2.50	3.00

Horizontal Swing Type Check Valve



Inlet Filters (for pressure units only)



Model Number	R1 & R2	R3	R4, R5 & SDR4	R6, SDR5 SDR6, R6P R6PP, R6PS	R7
Part #	AJ126B	AJ126C	AG338	AJ126F	AJ126G
Dim A	6.00"	6.00"	10.63"	10.63"	10.00"
Dim B	4.62"	7.12"	4.81"	4.81"	13.12"
Dim C	1" MPT	1 1/4" MPT	1 1/2" FPT	2" FPT	2 1/2" MPT
Replacement Element	AJ134B	AJ134C	AG340	AG340	AJ135A
Micron	10	10	25	25	10

All are heavy duty for high amounts of particulates.
Inlet filters for REGENAIR blowers are drip-proof when mounted as shown.

Pressure-Vacuum Gauge

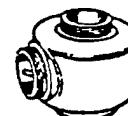


Pressure Gauge, Part #AJ496, 2 5/8" Diameter, 1/4" NPT, 0-60 inches H₂O and 0-150 mbar

Pressure Gauge, Part #AE133A, 2 5/8" Diameter, 1/4" NPT, 0-200 inches H₂O and 0-500 mbar

Vacuum Gauge, Part # AJ497, 2 5/8" Diameter, 1/4" NPT, 0-60 inches H₂O and 0-150 mbar

Vacuum Gauge, Part #AE134, 2 5/8", Diameter, 1/4" NPT, 0-160 inches H₂O and 0-400 mbar



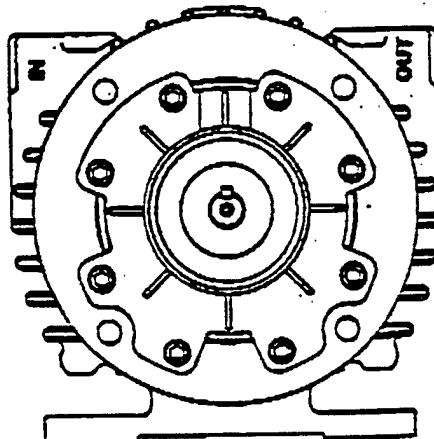
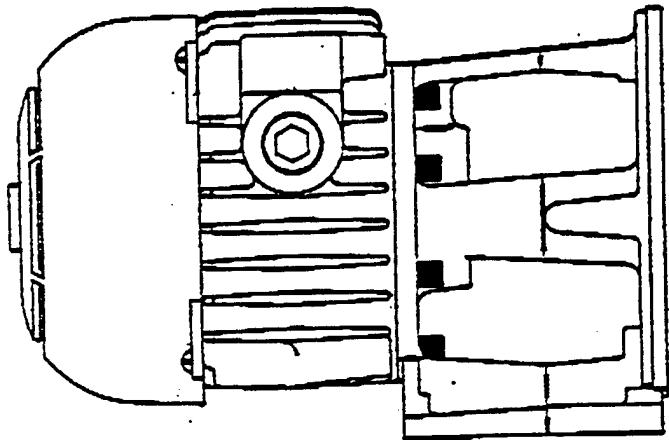
Relief Valve

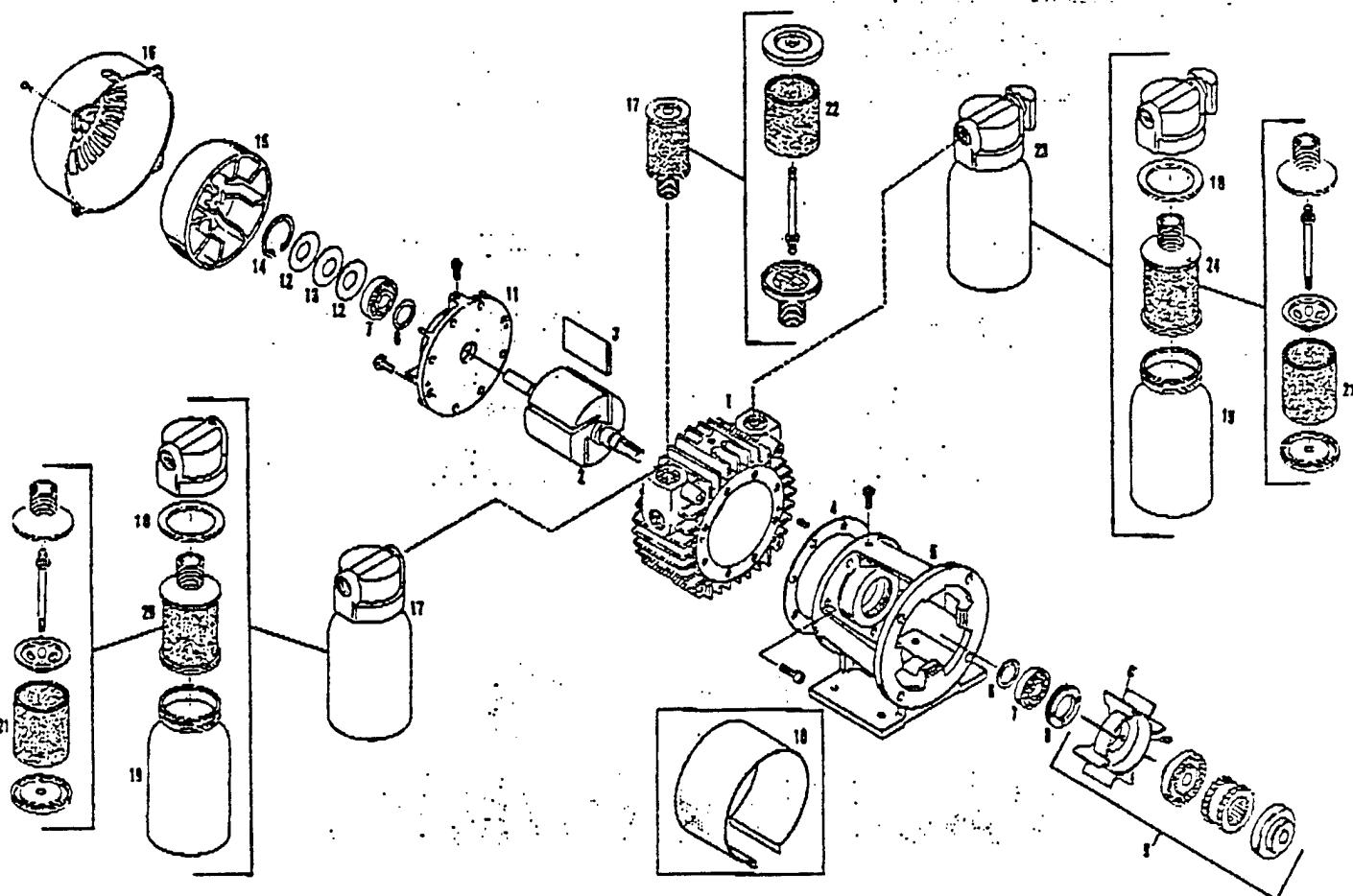
Pressure/Vacuum Relief Valve,
Part #AG258, 1 1/2" NPT,
Adjustable 30-170 inches H₂O.
200 CFM maximum

Silencer for Relief Valve, Part
#AJ121D

Model Number	R1, R2	R3	R4, R5 SDR 4" & SDR5"	R6, SDR6 R6P R6PP, R6PS	R7
Part #	AH326B	AH326C	AH326D	AH326F	AH326G
Dim. A	3.57	4.19	4.50	5.25	8
Dim. B	2.32	2.69	2.94	3.82	5.07
Dim. C	1" NPT	1 1/4" NPT	1 1/2" NPT	2" NPT	2 1/2" NPT

APPENDIX B
ROTARY-VANE BLOWER INFORMATION

70-230
G360PL
7-89**MANUFACTURING CORPORATION**P. O. BOX 97, BENTON HARBOR, MICHIGAN 49022
PHONE 616-926-6771**PARTS LIST and OPERATING
INSTRUCTIONS
1067, 2067, and 2567****OIL LESS
VACUUM PUMPS
and
COMPRESSORS****WARNING: UNIT SHOULD NOT PUMP EXPLOSIVE GASES OR
BE USED IN EXPLOSIVE AMBIENTS.**



REF. NO.	DESCRIPTION	PART. QTY.	1067-V102	1067-P102	2067-V102	2067-P102	2567-V102	2567-P102
1	Body	1	AH048	AH048	AH191	AH191	AH000	AH055
2	Rotor Assembly	1	AM428	AM428	AH192	AH192	AH192	AH192
3	Vane	4	AM400	AM400	AH190	AH190	AH195	AH195
4	Body Gasket	1	AH967	AH967	AH967	AH967	AH967	AH967
5	Foot Bracket	1	AH208	AH208	AH208	AH208	AH208	AH208
6	Deflector	2	AM192	AM192	AM192	AM192	AM192	AM192
7	Belt Bearing (Drive & Gear)	2	AC894	AC894	AC894	AC894	AC894	AC894
8	End Cap, Drive	1	AB339A	AB339A	AB339A	AB339A	AB339A	AB339A
9	Fan Coupling Assembly	1	AH198	AH198	AH198	AH198	AH198	AH198
10	Fan Guard	1	AH194	AH194	AH194	AH194	AH194	AH194
11	End Plate Gear	1	AH208	AH208	AH208	AH208	AH208	AH208
12	Bellows/Springs	2	AB337	AB337	AB337	AB337	AB337	AB337
13	Washer	1	AB338	AB338	AB338	AB338	AB338	AB338
14	Screw Ring	1	AC335	AC335	AC335	AC335	AC335	AC335
15	Fan	1	AC228	AC228	AC228	AC228	AC228	AC228
16	Fan Guard	1	AC1028	AC1028	AC1028	AC1028	AC1028	AC1028
17	Inlet Filter Assembly	1	AA800C	AA805F	AA800B	AA800G	AA800B	AA805G
18	Gasket	2	AA408		AA408		AA408	
19	Jar	2	AA401		AA401		AA401	
20	Filter Assembly	1	AC435-1		AC435-1		AC435-1	
21	Cartridge	2	AC193	AC193	AC193		AC193	
22	Filter Pleat	1		D3448		D3448		D3448
23	Muffler	1	AA800F		AA800F		AA800F	
24	Muffler Assembly	1	AC435-1		AC435-1		AC435-1	
Service Kit								
			K386	K386	K386	K357	K360	K357

* Denotes parts in service kit.
When corresponding or ordering spare parts, please give complete model and part numbers.

OPERATING AND MAINTENANCE INSTRUCTIONS

CONSTRUCTION: The end plate, body, rotor and foot bracket are all cast iron. Consequently any moisture that accumulates in the pump will tend to corrode the interior especially if it stands idle. The vanes are made of hard carbon and are precision ground. They should last 5,000 to 10,000 hours depending upon the degree of vacuum pressure at which the pump is run.

STARTING: CAUTION: NEVER LUBRICATE THIS OILLESS AIR PUMP. The carbon vanes and grease packed motor bearings require no oil. If the motor fails to start or slows down when under load shut the unit off and unplug. Check that the supply voltage agrees with the motor post terminals and the motor data name plate. **CAUTION: ALL DUAL VOLTAGE MOTORS ARE SHIPPED FROM THE FACTORY WIRED FOR THE HIGH VOLTAGE.** If the pump is extremely cold allow it to warm to room temperature before starting. If anything appears to be wrong with the motor return the complete pump to an authorized Gast service facility.

To minimize noise and vibration the unit should be mounted on a solid surface that will not resonate. Use of shock mounts or vibration isolation material is recommended. Inlet or discharge noise can be minimized by attaching the muffler. The unit should not be allowed to operate in ambient air temperatures in excess of 40°C (104°F). If the motor fails to start or slows down when under load shut the unit off and unplug. Check that the supply voltage agrees with the motor post terminal setup and the motor data name plate.

FILTRATION: Care must be taken to insure that any particles (dirt, chips, foreign material) often found in new plumbing not be allowed to enter the unit. Liquid, moisture vapor, or oil based contaminants will affect pump performance and must be filtered from entering the pump.

Dirty filters restrict air flow and if not corrected could lead to possible motor overload, poor performance and early pump failure. Check filters periodically and clean when necessary by removing felts and washing in Gast flushing solvent (part number AH255). Dry with compressed air and replace.

FLUSHING: Should excessive dirt, foreign particles, moisture, or oil be permitted to enter the pump the vanes

will act sluggish or even break. Flushing the pump should remove these materials. First remove the filter & muffler, clean with solvent & dry with compressed air.

DISASSEMBLY: Begin by removing the fan guard and fan. The dead end plate may be removed using a wheel puller. The vanes and body area can then be inspected for damage or further cleaning. Unless scoring is visible do not remove drive end plate and top clearance will be maintained. If further repair is required remove the spanner nut before using a wheel puller to remove the drive end plate. Both bearings are a press fit on the shaft.

REASSEMBLY: First attach the drive end plate (but do not tighten bolts) and press the bearing on the shaft (be sure to properly support the inner race). If required top clearance (between rotor & body) should then be set (for 1067 models it is .0015 and for 2067 and 2567 it is .003). Now replace the dead end plate and bearing. Then the bellville springs, washer and snap ring should be replaced. With a dial indicator on the dead end shaft to show any movement, install spanner nut (with adhesive to keep from vibrating loose) until indicator moves .002-.0025. Check shaft for ease of rotation.

HAZARD PREVENTION:

WARNING: MAKE SURE THE ELECTRIC MOTOR IS PROPERLY GROUNDED AND THE WIRING IS DONE BY A QUALIFIED ELECTRICIAN FAMILIAR WITH NEMA MG2 SAFETY STANDARDS, NATIONAL ELECTRIC CODE AND ALL LOCAL SAFETY CODES.

WARNING: THE ELECTRIC MOTOR MAY BE THERMALLY PROTECTED AND WILL AUTOMATICALLY RESTART WHEN THE PROTECTOR RESETS.

WARNING: WHEN SERVICING ALL POWER TO THE MOTOR MUST BE DE-ENERGIZED AND DISCONNECTED. ALL ROTATING COMPONENTS MUST BE AT A STAND STILL.

WARNING: DO NOT USE KEROSENE OR OTHER COMBUSTIBLE SOLVENTS OR OPERATE PUMP IN EXPLOSIVE AMBIENTS.

Performance Data

Model	Vacuum			Maximum Vacuum
	0" HG	10" HG	20" HG	
1067	8.5 CFM	5.0 CFM	2.0	26" HG
2067	16.0	9.0	3.0	27"
2567	20.0	13.0	5.0	27"

Model	Pressure			
	0 PSI	5 PSI	10 PSI	15 PSI
1067	8.5 CFM	7.5 CFM	7.0 CFM	6.5 CFM
2067	17.0	14.0	12.0	11.0
2567	21.0	19.0	17.0	16.0

Gast Manufacturing Co., Ltd.
Coronation Road, Cressex Estate
High Wycombe, Bucks HP12 3SN
England 23571
FAX 444-943-6588

Gast Manufacturing Corp.
2550 Meadowbrook Road
Benton Harbor MI 49022
616/926-6171
FAX 616-925-8288

Gast Manufacturing Corp.
505 Washington Ave.
Carlstadt NJ 07072
201/933-8484
FAX 201-933-5545

Brenner-Fiedler & Assoc.
13824 Bentley Place
Cerritos, Ca. 90701
213-404-2721
FAX 213-404-7975

Wainbee, Ltd.
121 City View Drive
Rexdale, Ontario, Canada M9W 5A9
416/243-1900
FAX 416-243-2336

Wainbee, LTD.
215 Brunswick Blvd.
Pointe Claire, Montreal
Canada H9R 4R7
514/697-8810
FAX 514-697-3070

Note: All general correspondence should be directed to Gast Mfg Corp, P.O. Box 97, Benton Harbor, MI 49022

ACCESSORIES

CHECK VALVES—VACUUM

	AE236	1/4" NPT, male
	AJ350	1/4" NPT, female
	AJ350A	1/4" NPT, female

CHECK VALVES—VACUUM SWING

	AM328A	3/8" NPT
	AM328B	1" NPT

CORDS—ELECTRIC

	AA816	1/2" 1/2" 3/4" hp, 115V without switch, 10 ft.
	AA818	1/2" 3/4" hp, 230V without switch, 10 ft.
	AA819	1/2" 1/2" 1/2" hp, 115 V with switch, 10 ft.

FILTERS—no jar

	AC432	3/4" female NPS, 10 m micron
	AC433	1/2" male NPS, 10 m micron
	AC435	3/4" male NPS, 10 micron
	AA509B	3/4" female NPS, 50 micron
	AA509F	1/2" male NPS, 50 micron
	AA509G	1/2" male NPS, 50 micron
	E300A	1/2" male NPS, 50 micron
	E300B	1/2" male NPS, 50 micron
	AD750	1" male NPS, 50 micron

FILTERS—glass jar

	AA617G	1/2" NPS, 2 oz., 50 micron
	AA622H	1/2" NPS, 1/2 qt., 50 micron
	AD640	1" NPS, 2 qt., 50 micron
	AB680	3/4" NPS, 1 pt., 10 micron
	AB595C	3/4" NPS, 1 pt., 50 micron
	AD600	1/2" NPS, 1 pt., 50 micron
	AB600F	1/2" NPS, 1 pt., 10 micron
	AB601B	1/2" NPS, 1 pt., 10 micron
	AB601C	3/4" NPS, 1 pt., 50 micron
	AA600C	1/2" NPS, 1 qt., 10 micron
	AA600E	1/2" NPS, 1 qt., 50 micron
	AA600G	3/4" NPS, 1 qt., 10 micron
	AA600J	3/4" NPS, 1 qt., 50 micron
	V400G	1/2" NPS, 8 oz., 50 micron
	V500D	1/2" NPS, 8 oz., 50 micron
	V500G	1/2" NPS, 8 oz., 50 micron

FILTERS—metal jar

	AB609C	1/2" NPS, 1/2 pt., 10 micron
	AB611Z	1/2" NPS, 1/2 pt., 10 micron
	AB608B	3/4" NPS, 1/2 pt., 10 micron
	AB608C	1/2" NPS, 1/2 pt., 50 micron
	AB608E	1/2" NPS, 1/2 pt., 50 micron
	AB650C	3/4" NPS, 1 qt., 10 micron
	AB650G	3/4" NPS, 1 qt., 50 micron
	AB650J	3/4" NPS, 1 qt., 10 micron
	AB650K	1/2" NPS, 1 qt., 50 micron
	AB650L	1/2" NPS, 1 qt., 10 micron

FILTERS—plastic jar

	AA522N	1/2" NPS, 1/2 qt.
	V400H	1/2" NPS, 8 oz.
	V500N	3/4" NPS, 8 oz.

FLUSHING SOLVENT

	AH255	1 qt.
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FOOT SUPPORT ASSEMBLIES

	AC135	0211, 0222, 0522
	AE240	1/4"-1/2" hp piston pump
	AE241	1/2"-3/4" piston pump
	AE245	1/2" hp diaphragm pump

GAUGES—PRESSURE

	AA642	1/4" NPS, 0-30 psi
	AA644B	1/4" NPS, 0-30 psi 0-25°Cmt
	AB608	1/4" NPS, 0-100 psi (back mount)
	AA607	1/4" NPS, 0-100 psi (back mount)
	AP563	1/4" NPS, 0-100 psi, heavy duty (bottom mount)

GAUGES—VACUUM

	AA640	1/4" NPS, 0-30" Hg, 0-760 mm Hg
	AA641	1/4" NPS, 0-30" Hg

HANDLES—carrying

	AP533	for 1/2" and 3/4" hp units
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MUFFLERS—glass jar

	AB599B	3/4" NPS, 1 pt., 10 micron, for oil-less pumps
	AB600C	1/2" NPS, 1 pt., 50 micron, for oil-less pumps
	AB600J	1/2" NPS, 1 pt., 50 micron, for oil-less pumps
	AD640	1" NPS, 2 qt., 50 micron
	AB590B	1" NPS, 2 qt., 50 micron, with silencer for quieter operation
	AA600F	3/4" NPS, 1 qt., 10 micron, for oil-less pumps
	AA600G	3/4" NPS, 1 qt., 50 micron, for oil-less pumps
	AA622B	1" NPS, 3/4" oz., 50 micron, for oil-less pumps
	AA622C	same as AA622 but with silencing tube
	AA617P	1/2" NPS, 2 oz., 50 micron, for oil-less pumps

MUFFLERS—metal jar

	AB612A	1/2" NPS, 1/2 pt., 10 micron
	AB609B	1/2" NPS, 1/2 pt., 10 micron
	AB609A	3/4" NPS, 1/2 pt., 10 micron
	AB609C	1/2" NPS, 1 pt., 10 micron
	AB609D	3/4" NPS, 1 pt., 10 micron

MUFFLERS—plastic jar

	AA622P	1/2" NPS, 3/4" oz.
	V428M	1/2" NPS, 8 oz.
	V525G	1/2" NPS, 8 oz.

OVERLOADS—motor

		External thermal protector, specify motor number and rating
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PAINT

	AE584A	Gloss blue-gray, 16 oz. aerosol can
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RELIEF VALVES—PRESSURE

	AA203	1/4" NPS, flow below 2 cm
	AA206	1/4" NPS, flow below 2 cm
	AA600	3/4" NPS, flow below 10 cm
	AA607	3/4" NPS, flow above 10 cm
	AP570S	1/4" NPS, 0-100 psi
	AF730	1/4" NPT, 0-100 psi
	AE900	1" NPT, 0-100 psi

RELIEF VALVES—VACUUM

	AA204	1/4" NPS, flow below 2 cm
	AA207	1/4" NPS, flow below 2 cm
	AA604A	3/4" NPS, flow from 2-15 cm
	AA608	4" NPS, flow above 10 cm
	AE801	1" NPS, for 4563, 5500

SWITCH—vacuum

	AE265	1/4" NPS
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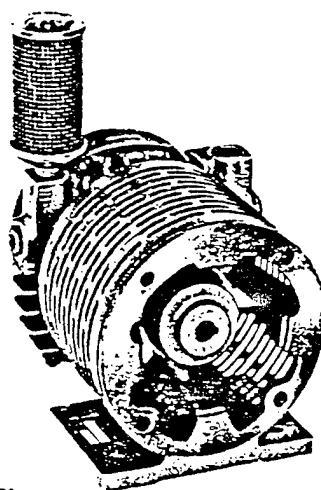
TRAPS—vacuum

	AA673	1/4" NPS, 8 oz.
	AA673B	1/4" NPS, 2 oz.
	AA675C	1/4" NPS, 2 oz.

TROUBLE SHOOTING GUIDE FOR ROTARY VANE PUMPS

REASONS FOR PROBLEM	Low		High		Pump Overheating	Motor Overload
	Vac.	Press.	Vac.	Press.		
Filter dirty	X	X			X	X
Muffler dirty		X			X	X
Vac. line collapsed	X				X	X
Relief valve set too high			X	X	X	X
Relief valve set too low	X	X				
Plugged vacuum or pressure line	X	X			X	X
Vanes sticking	X	X				
Running at too high RPM			X	X	X	X
Vanes worn (replace)	X	X				
Shaft seal worn (replace)	X	X				
Dust or offset powder in pump	X	X			X	X
Motor not wired correctly	X	X			X	

Oilless 1067, 2067, 2567 Series



EUROPEAN MODEL

Product Dimensions Metric (mm)

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1067	195	100	144	72	288	180	102	11	125	165	241	142	19	80
2067	195	100	144	72	269	180	102	11	125	165	284	164	19	80
2567	195	100	144	72	289	180	102	11	125	165	284	164	19	80

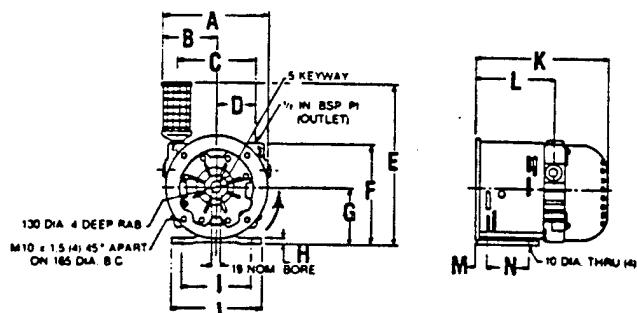
U.S. MODEL

Product Dimensions Metric (mm) U.S. Imperial (inches)

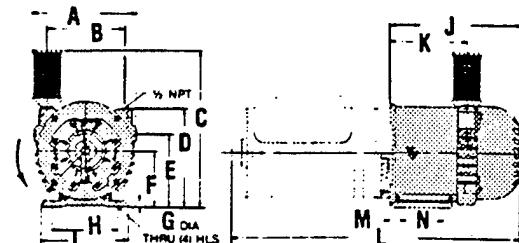
Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1067	195	145	287	180	132	102	11	124	165	241	142	495	21	76
1067	7.69	5.69	11.31	7.09	5.19	4.0	.44	4.88	6.50	9.50	5.59	19.50	.84	3.00
2067	194	145	287	180	132	102	11	124	165	284	164	584	21	76
2067	7.63	5.69	11.31	7.09	5.19	4.0	.44	4.88	6.50	11.19	6.44	23.00	.84	3.00
2567	194	145	287	180	132	102	11	124	165	284	164	584	21	76
2567	7.63	5.69	11.31	7.09	5.19	4.0	.44	4.88	6.50	11.19	6.44	23.00	.84	3.00

Dimensions for reference only.

METRIC MODEL



U.S./IMPERIAL MODELS
NEMA 56, C FACE



MODEL 1067 SERIES

15 PSI MAX. PRESSURE, 8.50 CFM OPEN FLOW

MODEL 2067 SERIES

15 PSI MAX. PRESSURE, 17.00 CFM OPEN FLOW

MODEL 2567 SERIES

15 PSI MAX. PRESSURE, 21.00 CFM OPEN FLOW

PRODUCT FEATURES

- Oilless operation
- Close coupled easy motor mounting
- Rugged construction/low maintenance
- Essentially pulse free service

INCLUDES

- Filter AA905F (1067), AA905G (2067/2567)
- Fan/coupling assembly AH198
- Fan guards AC102C, AH194

RECOMMENDED ACCESSORIES

- Pressure relief valve AA600 (1067), AA307 (2067/2567) (U.S. version)
- Pressure gauge AA644B (U.S. version)
- Repair kit K356 (1067)
- Repair kit K350 (2067/2567)

Important Notice:

Pictorial and dimensional data is subject to change without notice.

Product Specifications

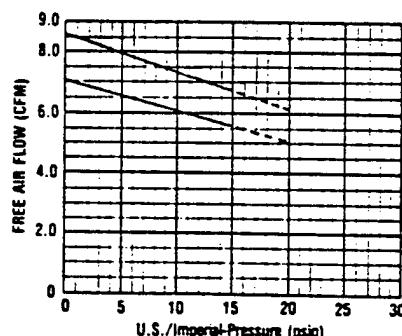
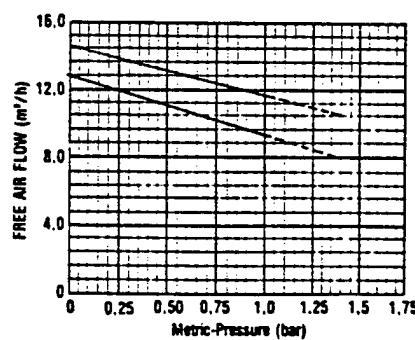
Model Number	Motor	RPM		HP	kW	Net Wt.	
		60 cycle	50 cycle			lbs.	kg
1067-P102	Not included	1725	1425	1	0,75	34	15,40
1067-P104 (metric)	Not included	1725	1425	1	0,75	34	15,40
+1067-P106-G561X (like 1067-P102 plus motor)	110/220-240; 115/208-230; 50/60-1	1725	-	1	0,75	65	29,5
2067-P102	Not included	1725	1425	1	0,75	47	21,3
2067-P104 (metric)	Not included	1725	1425	1	0,75	47	21,3
+2067-P106-G561X (like 2067-P102 plus motor)	110/220-240; 115/208-230; 50/60-1	1725	-	1	0,75	92	41,7
2567-P102	Not included	1725	1425	2	1,5	46	20,9
2567-P104 (metric)	Not included	1725	1425	2	1,5	46	20,9
2567-P106-G475 (like 2567-P102 plus motor)	230/460-60-3	1725	-	2	1,5	81	36,8

+Motor includes Thermotector.

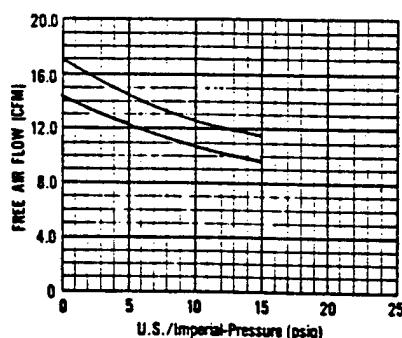
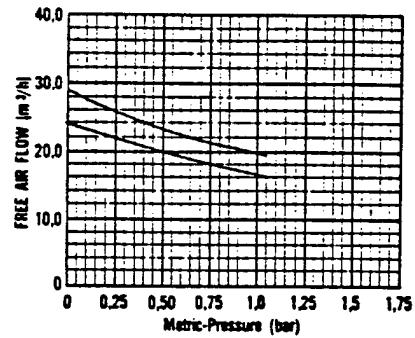
Product Performance (Metric U.S. Imperial)

Black line on curve is for 60 cycle performance.
Blue line on curve is for 50 cycle performance.

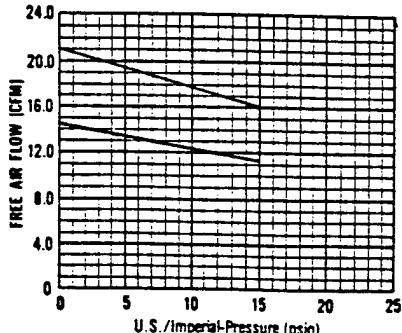
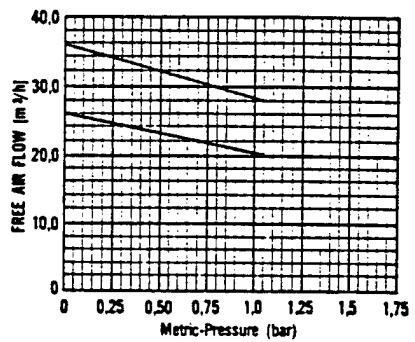
Model 1067



Model 2067



Model 2567



**APPENDIX C
DATA COLLECTION SHEETS**

BLOWER MAINTENANCE RECORD (INJECTION)

Site: _____

- *** If blower is not running, immediately contact Fred Stanin, Engineering—Science, (510) 769-0100.
1 If inlet vacuum exceeds ____ inches of water, shut blower down and contact Engineering—Science.
2 If outlet pressure exceeds ____ inches of water, shut blower down and contact Engineering—Science.
3 If outlet temperature exceeds 160°F, shut blower down and contact Engineering—Science.
Once a month, this sheet must be FAXed to: Fred Stanin, Engineering—Science, (510) 769-9244.

NOTE: Once a month, this sheet must be FAXed to: Fred Stanin, Engineering-Science, (510) 769-9244.

BLOWER MAINTENANCE RECORD (INJECTION)

Site: _____

- If blower is not running, immediately contact Fred Stanin, Engineering—Science, (510) 769-0100.
If inlet vacuum exceeds ____ inches of water, shut blower down and contact Engineering—Science.
If outlet pressure exceeds ____ inches of water, shut blower down and contact Engineering—Science.
If outlet temperature exceeds 160°F, shut blower down and contact Engineering—Science.
Once a month, this sheet must be FAXed to: Fred Stanin, Engineering—Science, (510) 769-9244.

NOTE: Once a month, this sheet must be FAXed to: Fred Stanin, Engineering—Science, (510) 769-9244.

BLOWER MAINTENANCE RECORD (INJECTION)

Sister

Location:

Engineering—Science, (510) 762-0100.

If blower is not running, immediately contact Head Jeann, Engineering or Head 2nd and contact Engineering Science

If inlet vacuum exceeds ____ inches of water, shut blower down and contact Engineering — Science.

If outlet pressure exceeds ____ inches of water, shut blower down and contact Engineering—Science

NOTE: On a 2 mm. shaft, this chart must be FAxED to Fred Starin, Engineering—Science, (510) 769-9244. If outlet temperature exceeds 100°F, snub blower down and contact Engineering Science.

BLOWER MAINTENANCE RECORD (INJECTION)

Site: _____ Location: _____

• If shower is not running, immediately contact Fred Stanin, Engineering-Science, (510) 769-0100.

If inlet vacuum exceeds _____ inches of water, shut blower down and contact Engineering—Science.

2 If outlet pressure exceeds ____ inches of water, shut blower down and contact Engineering-Science.

3 If outlet temperature exceeds 160°F , shut blower down and contact Engineering—Science.

06/17/93

BLOWER MAINTENANCE RECORD (INJECTION)

نعتیں

Location:

- **** If blower is not running, immediately contact Fred Stanin, Engineering—Science, (510) 769—0100.
1 If inlet vacuum exceeds ____ inches of water, shut blower down and contact Engineering—Science.
2 If outlet pressure exceeds ____ inches of water, shut blower down and contact Engineering—Science.
3 If outlet temperature exceeds 160°F, shut blower down and contact Engineering—Science.

E: Once a month, this sheet must be FAXed to: Fred Stanin, Engineering—Science, (510) 769—9244.

NOTE: Once

reg_inj
06/17/93

APPENDIX C

CHAIN OF CUSTODY FORMS

CHART OF CUSTODY RECORD

THE HISTORICAL RECORD

ENTOMOLOGICAL SOCIETY OF AMERICA	1960
ONE BRADDOCK WAY, SUITE 500 DENVER, COLORADO 80202 303-434-5400	NAME: FALL CHILLID AFB
	SELLER: PS-1B
	SELLER: DE26A. 40 .00

S. THOMAS TAYLOR (*s. Thomas Taylor*)

ENGINEERING-SCIENCE, INC.
720 Boundary, Suite 300 • Denver, Colorado
303 591-8100

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5

CHAIN OF CUSTODY RECORD

CHAIN OF CUSTODY RECORD

AFCEE BIOVENTING PILOT TESTS

Base: Fairchild AFB, WA

Site: P5-1A

Signature:

Michael B. Phelps: Michael B. Phelps
Chris L. Munson: Chris L. Munson

Michael B. Phelps: Michael Phelps
Chris L. Munson: Chris L. Munson

Ship To:
AIR TOXICS LTD.
180 Blue Ravine Road, Suite B
Folsom, CA 95630

ATTN: Bob Freeman
(916) 985-1000 (voice)
(916) 985-1020 (FAX)

Preston

卷之三

ENGINEERING-SCIENCE, INC.

1100 BROADWAY, SUITE 900
DENVER, COLORADO 80239
~~303-871-8700~~

ES Job No.

CHAIN OF CUSTODY RECORD

CHAIN OF CUSTODY RECORD

ENGINEERING-SCIENCE, INC.		AFCCEE BIOVENTING PILOT TESTS
1700 BROADWAY, SUITE 800 DENVER, COLORADO 80239 303-631-9100		Base: Fairchild AFB
ES Job No. DE268. 4 C 08		Site: Blag 2034

Elizabeth Rosenberg
Stephanie Palmer

Date	Time	Sample Description	Lab I.D.	No. of Cont.
10/14/43	1834	Z034 - SPT3 - B		-
10/14/43	1443	Z034 - VMP1 - 7		-
"	1448	Z034 - VMP3 - D. S		-
"	1455	Z034 - VW1 WPA		-
10/14/43	1430	Z034 - SPT3 - A		-

Relinquished by: (Signature) Elizabeth Brown Date / Time: (Signature) 1800 11:13 Received for Laboratory by: (Signature)

Completed by: _____ **Date / Time** _____ **Placed by Laboratory by:** _____ **(Signature)**

Distribution: Original Accompanies Shipment. Copies to: Coordinator Field Files
Editorial Express Number:

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H. E. Shaw 510-769-9241

Journal of Health Politics, Policy and Law

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1700 Broadway, Suite 800 • Denver, Colorado

APPENDIX D

AIR PERMEABILITY TEST RESULTS

FIGURE D.1

Air Permeability Test
VMP1-4 & VMP1-7.5; radius = 11.5 feet
PS-2 - Fairchild AFB, Washington

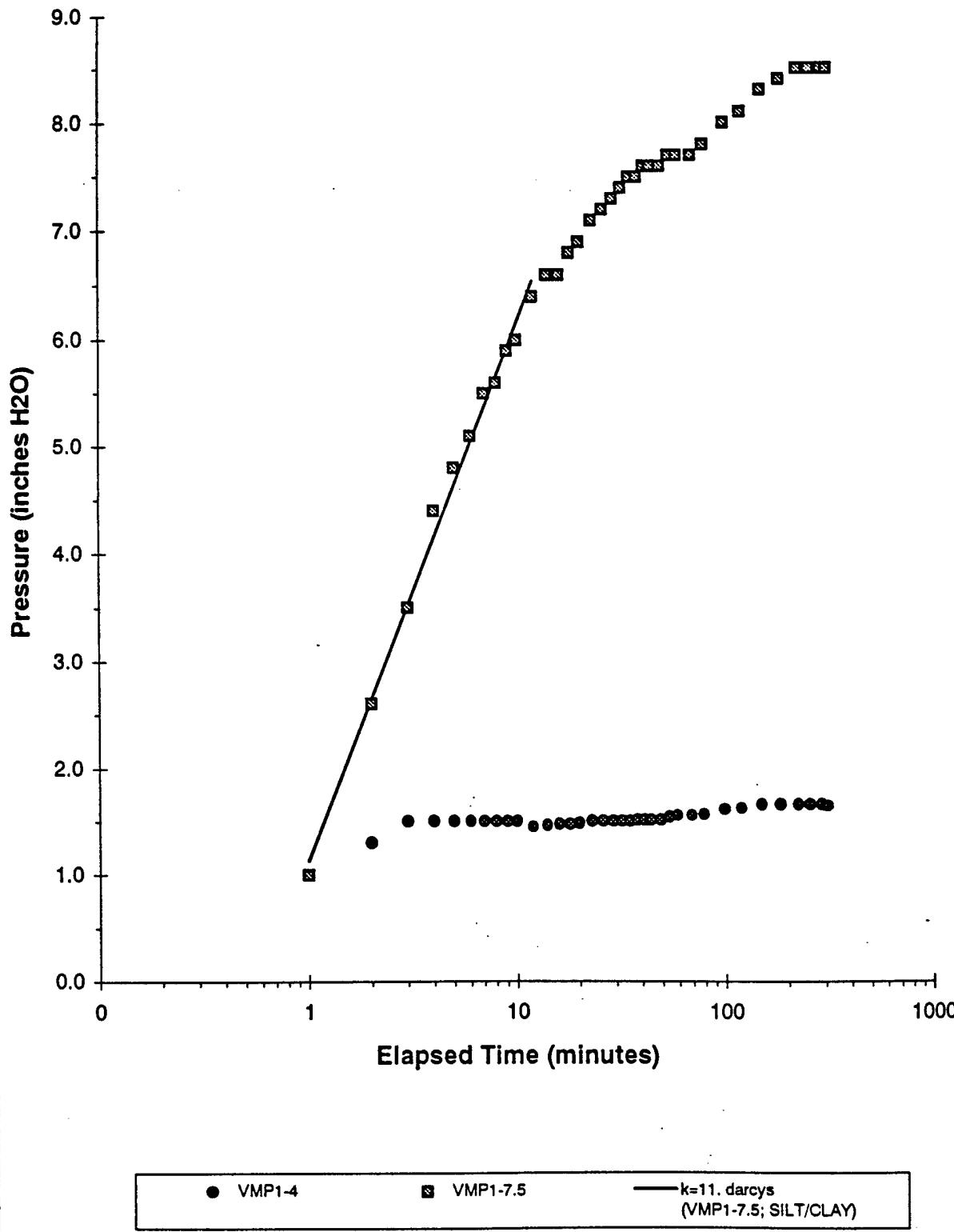


FIGURE D.2

Air Permeability Test
VMP2-4 & VMP2-6.5; radius = 20 ft
PS-2 - Fairchild AFB, Washington

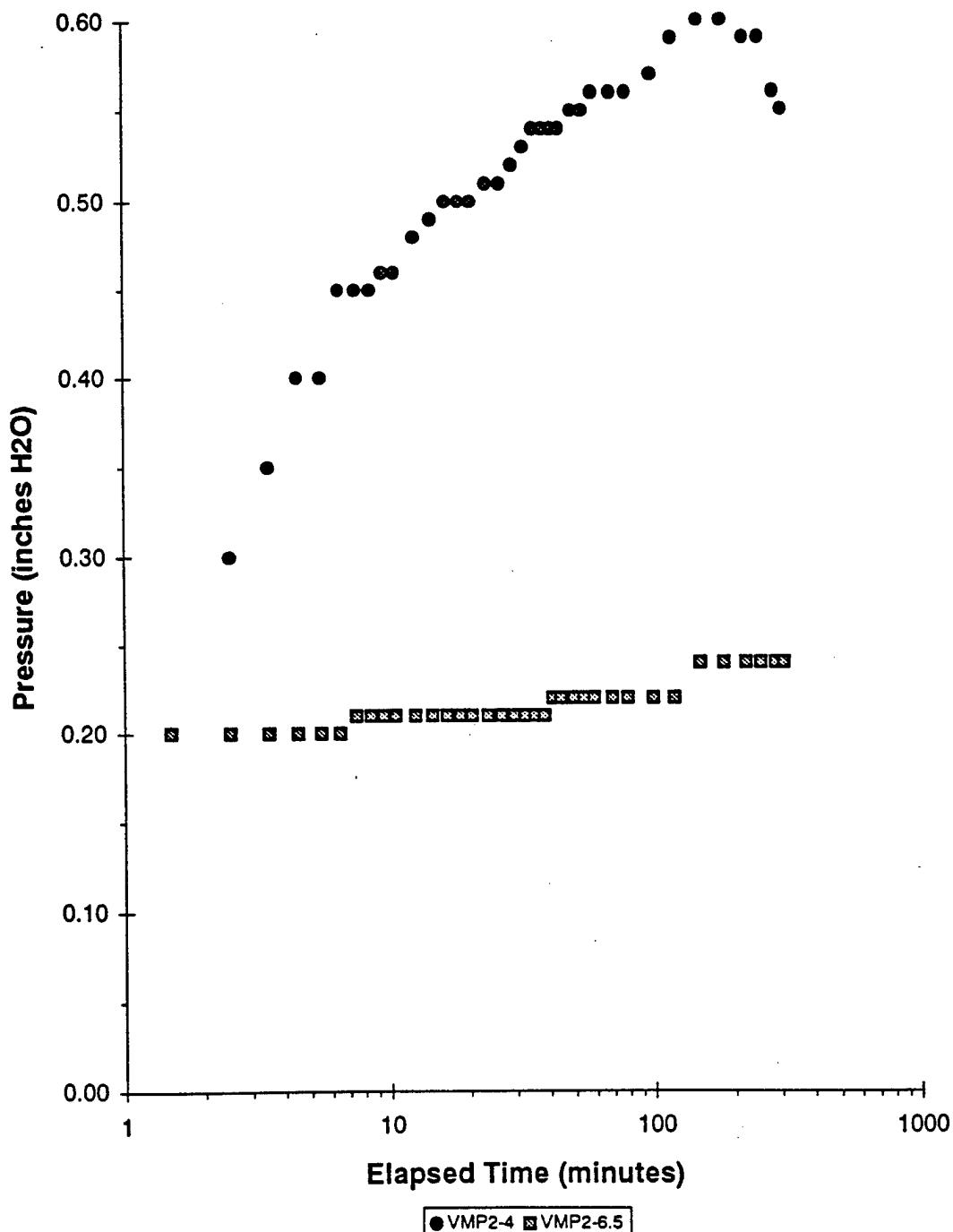


FIGURE D.3

Air Permeability Test
VMP3-4 & VMP3-7; radius = 40 feet
PS-2 - Fairchild AFB, Washington

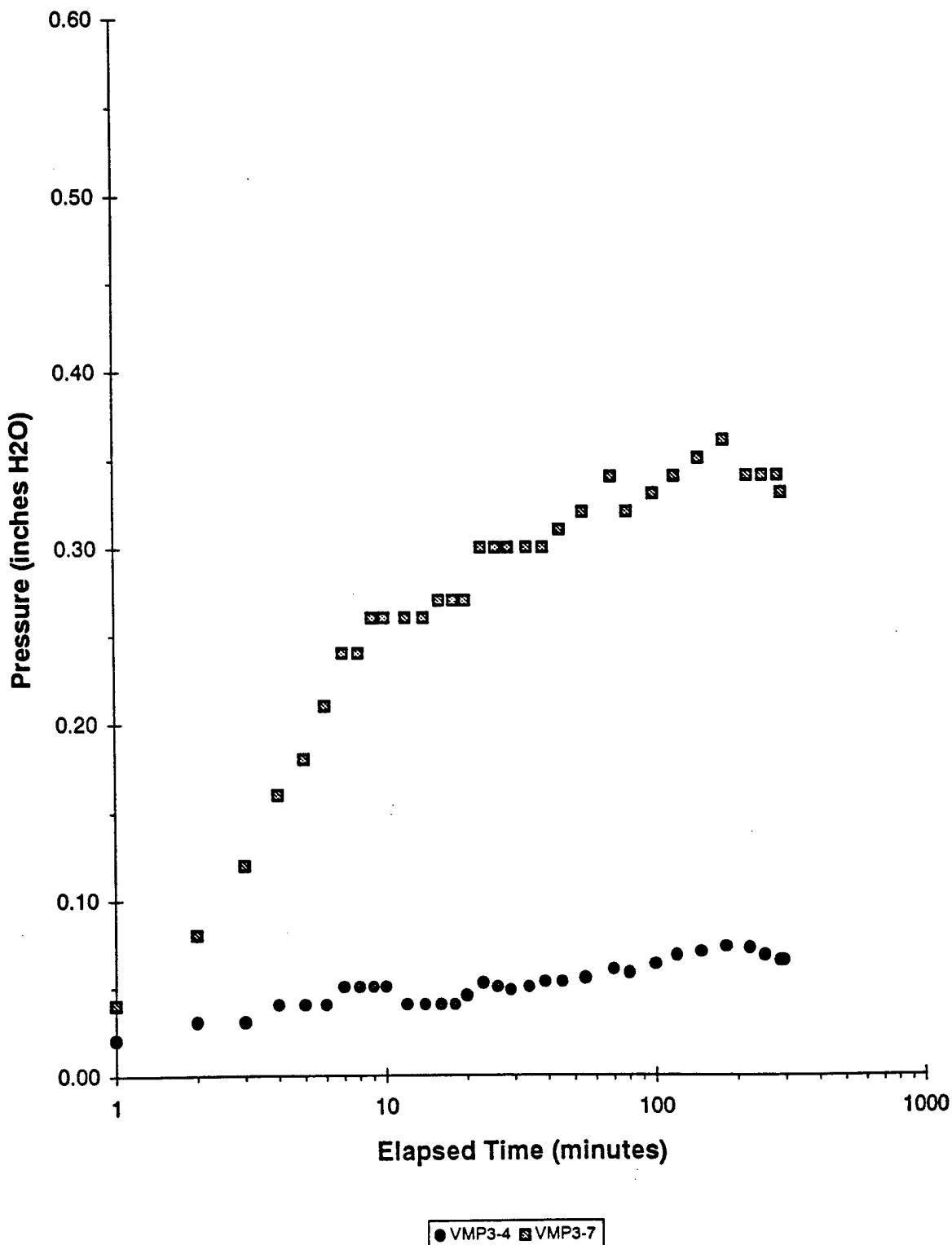
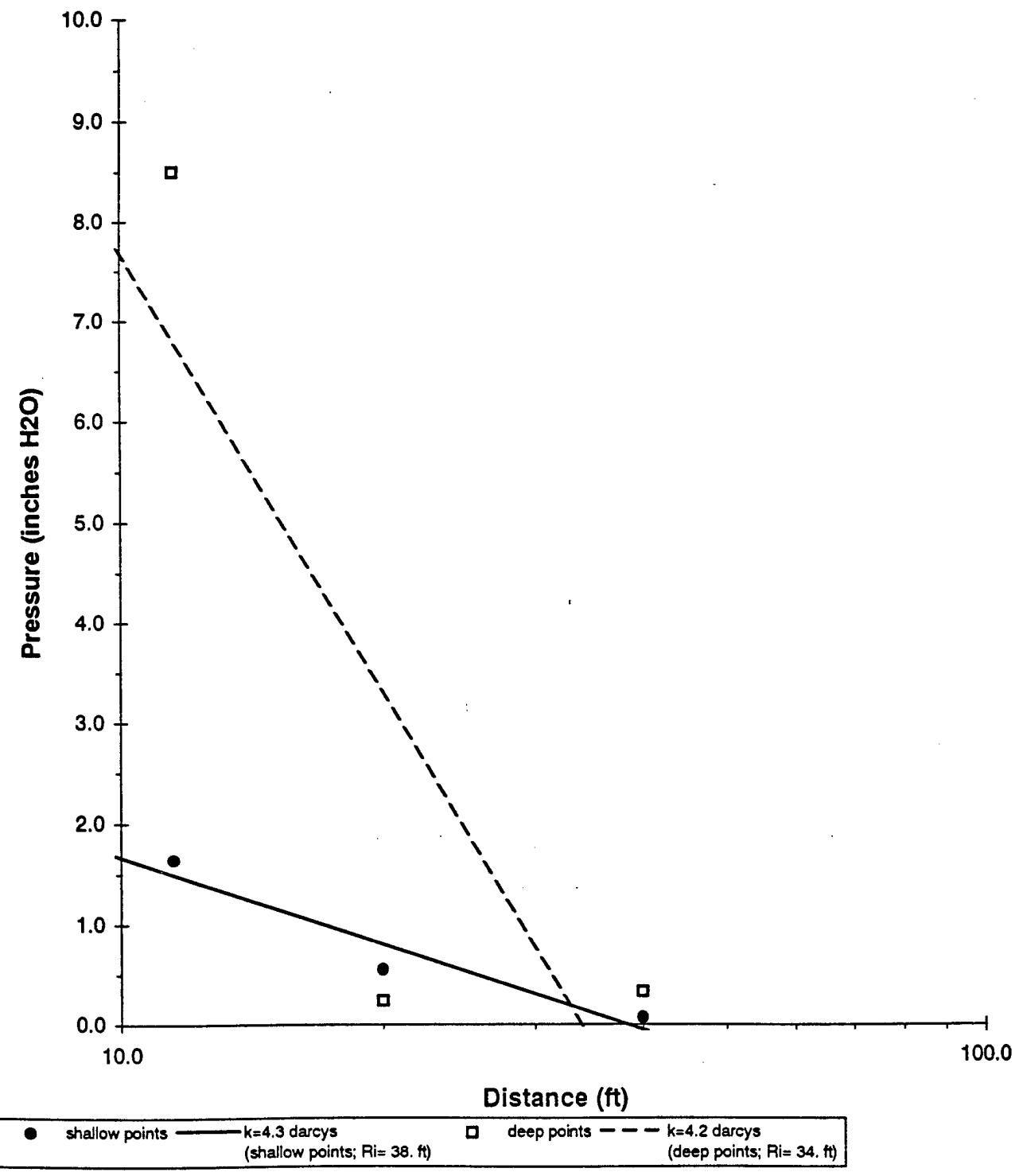


FIGURE D.4

Air Permeability Test
Steady-state Calculation Method
PS-2 - Fairchild AFB, Washington



ENGINEERING-SCIENCE, INC.

FIGURE D.5

Air Permeability Test
VMP1-4 & VMP1-6; radius = 10 feet
PS-1A - Fairchild AFB, Washington

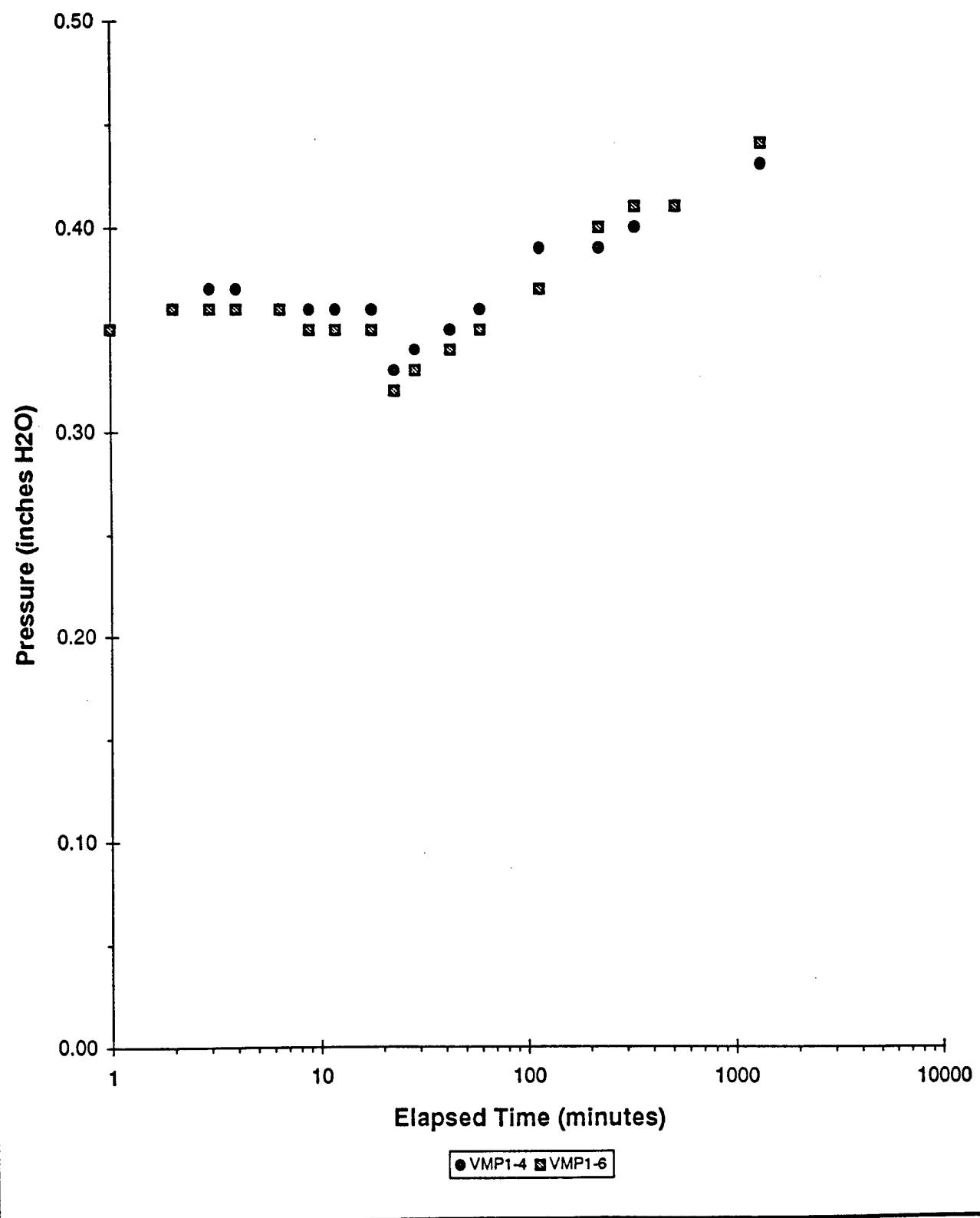


FIGURE D.6

Air Permeability Test
VMP2-3 & VMP2-5.5; radius = 25 ft
PS-1A - Fairchild AFB, Washington

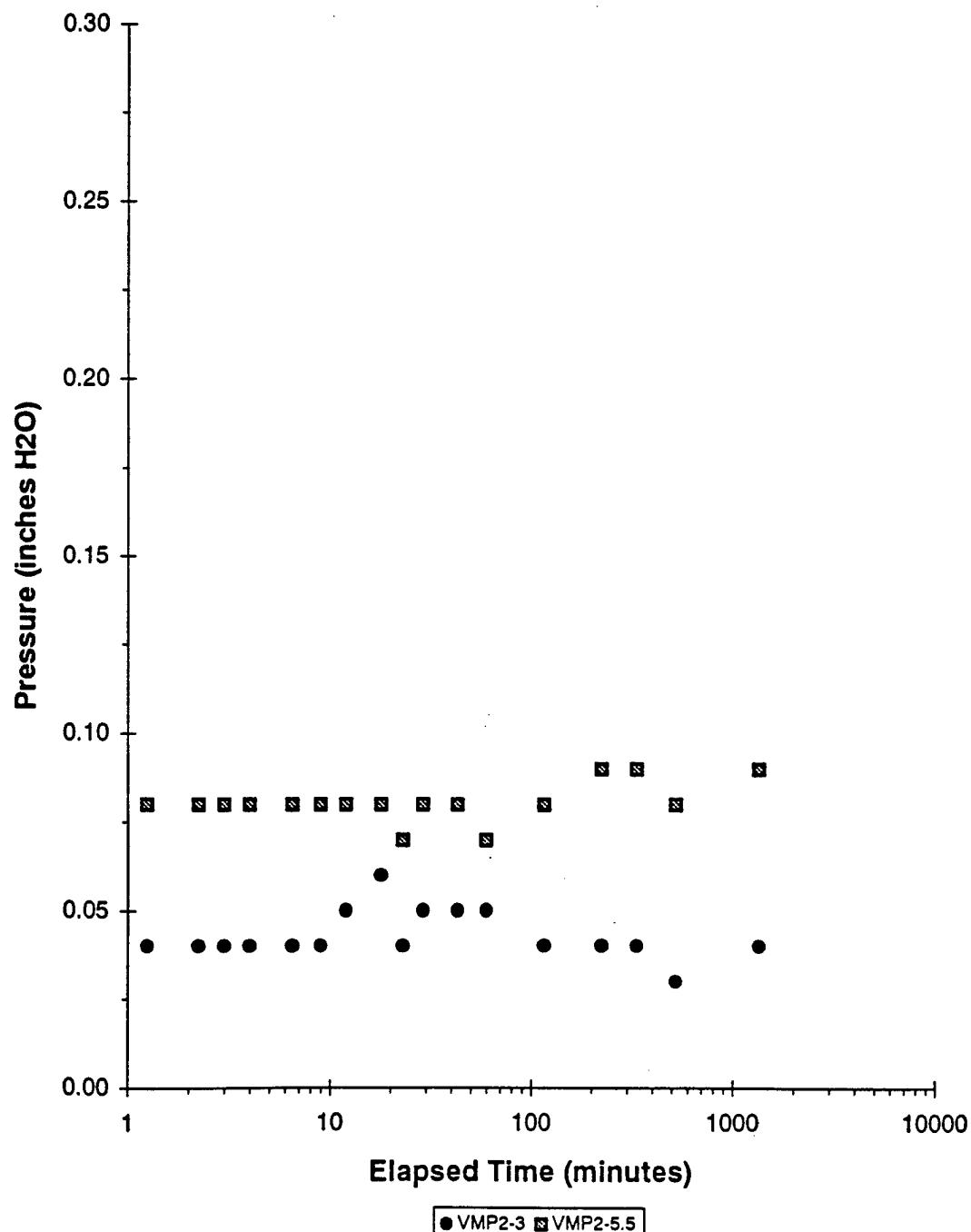


FIGURE D.7

Air Permeability Test
VMP3-3 & VMP3-5.5; radius = 45 feet
PS-1A - Fairchild AFB, Washington

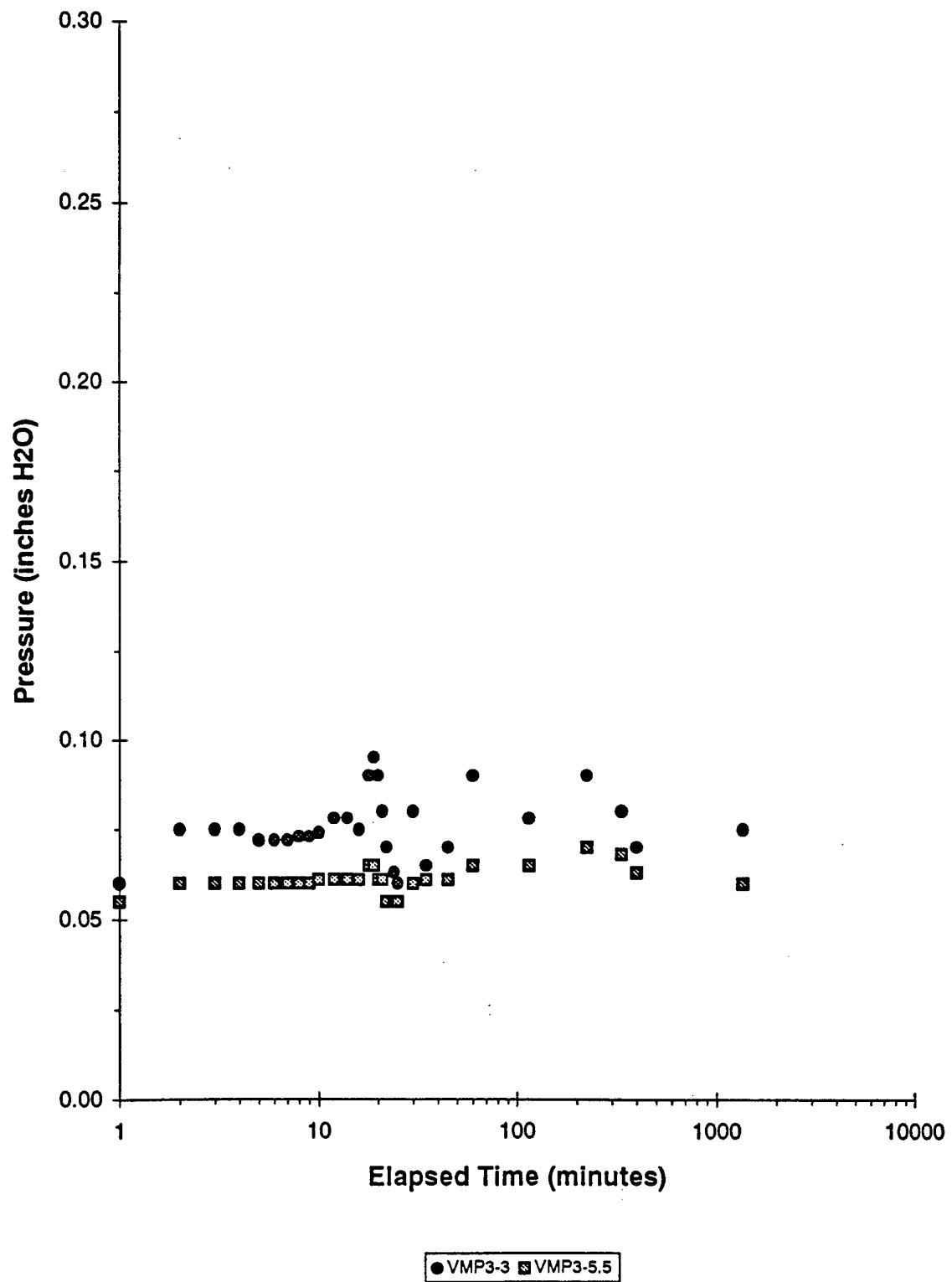


FIGURE D.8

Air Permeability Test
Steady-state Calculation Method
PS-1A - Fairchild AFB, Washington

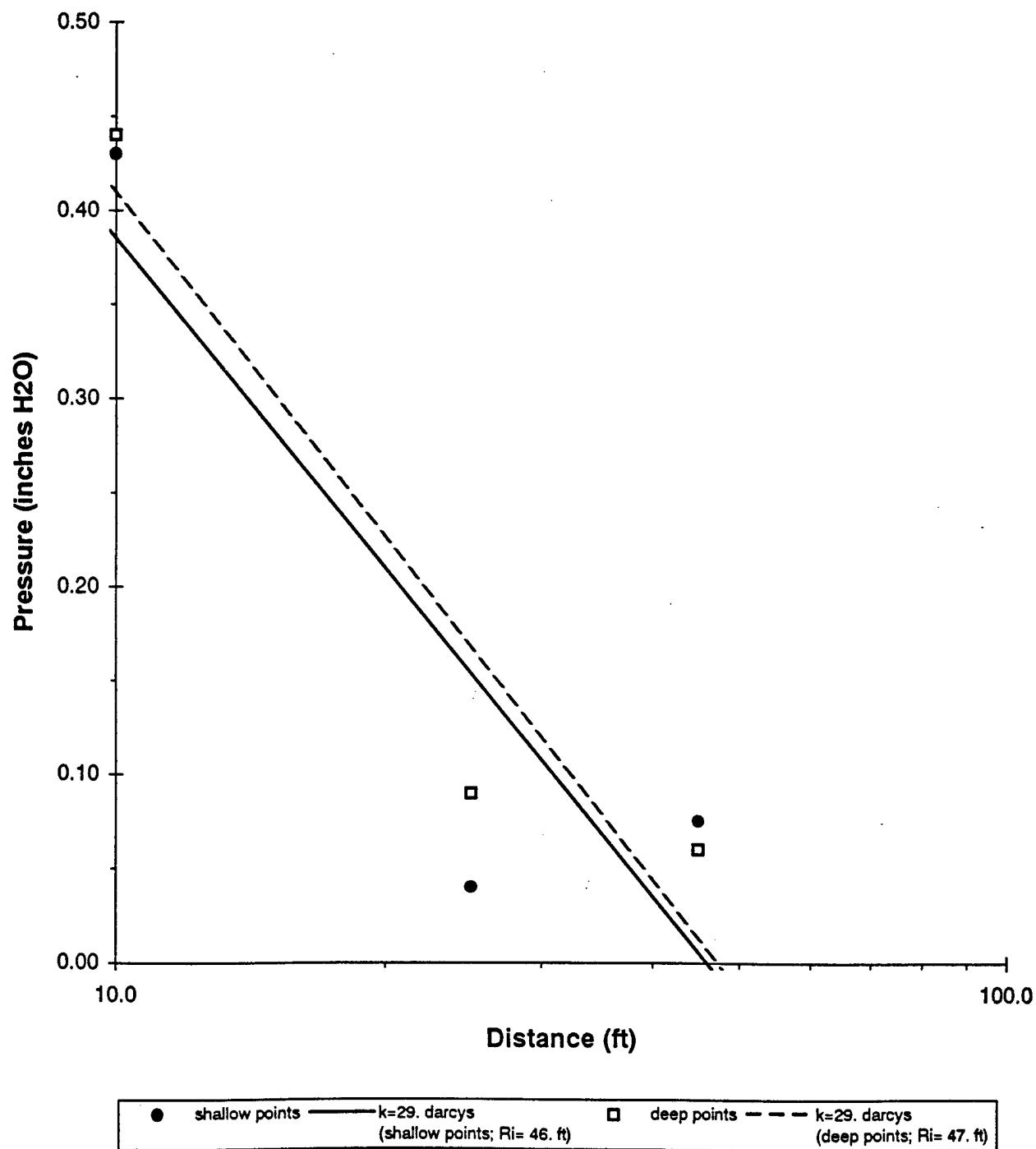
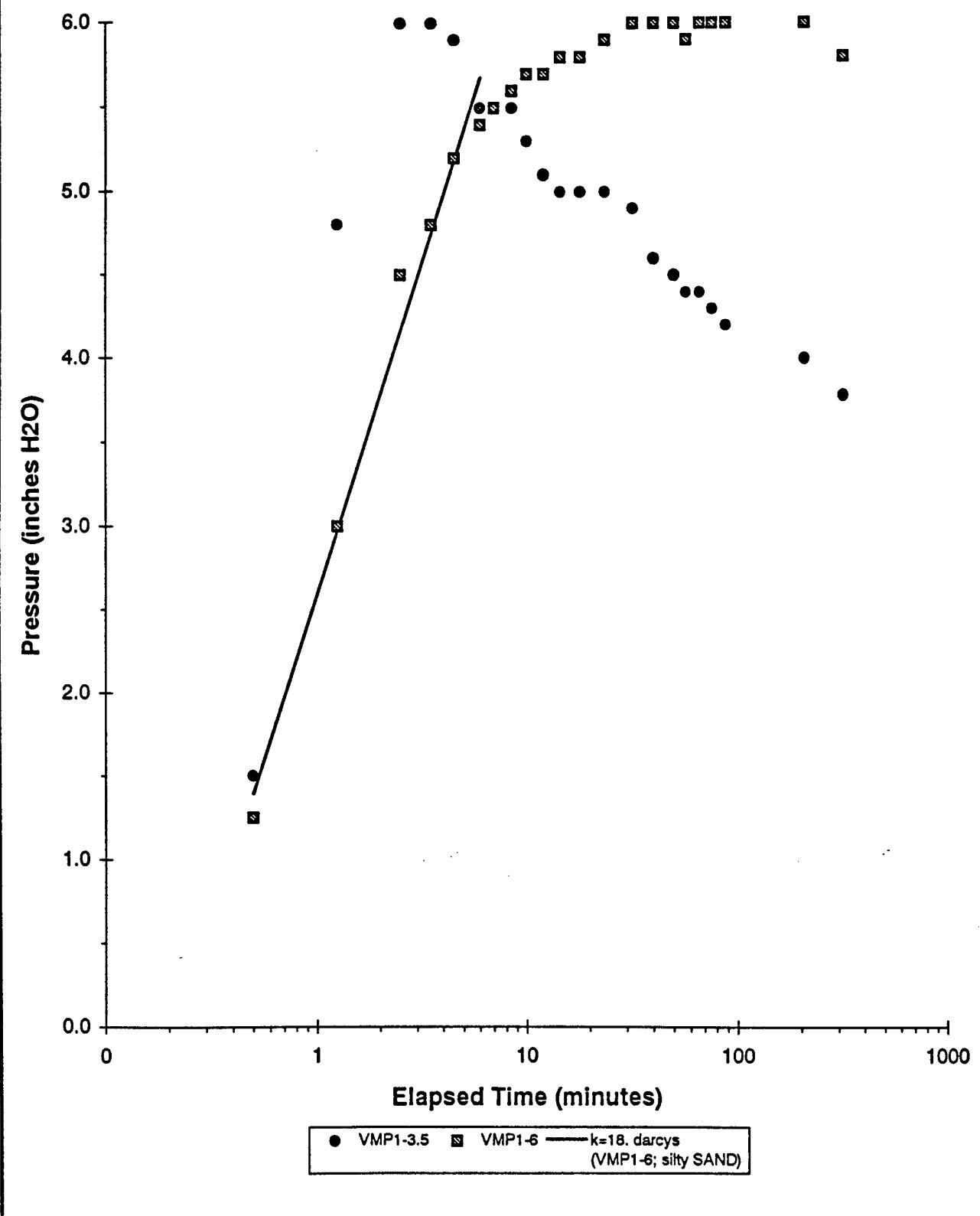


FIGURE D.9

Air Permeability Test
VMP1-3.5 & VMP1-6; radius = 10 feet
PS-1B - Fairchild AFB, Washington



Air Permeability Test
VMP2-3 & VMP2-5.5; radius = 23 ft
PS-1B - Fairchild AFB, Washington

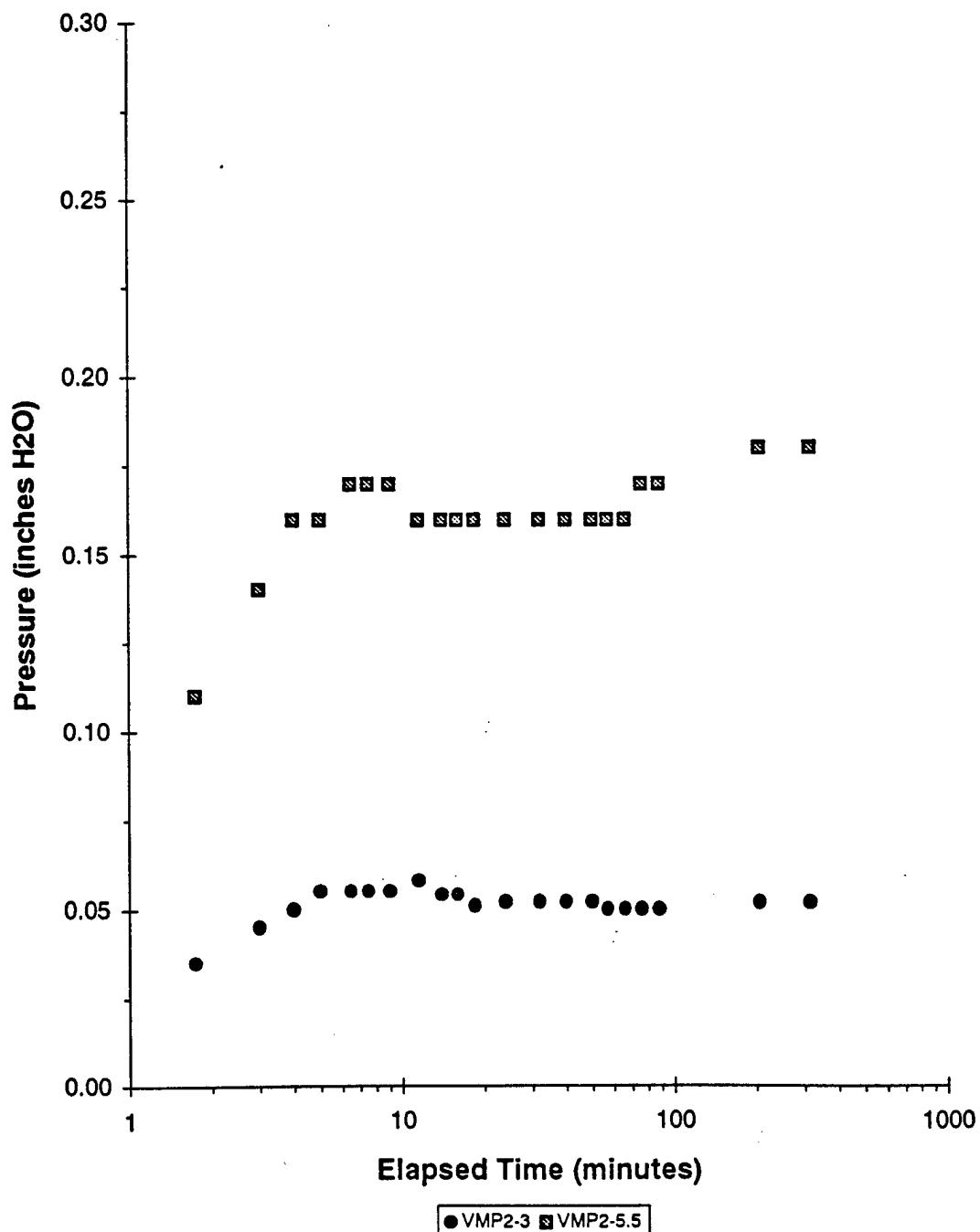


FIGURE D.11

Air Permeability Test
VMP3-3 & VMP3-5; radius = 40 feet
PS-1B - Fairchild AFB, Washington

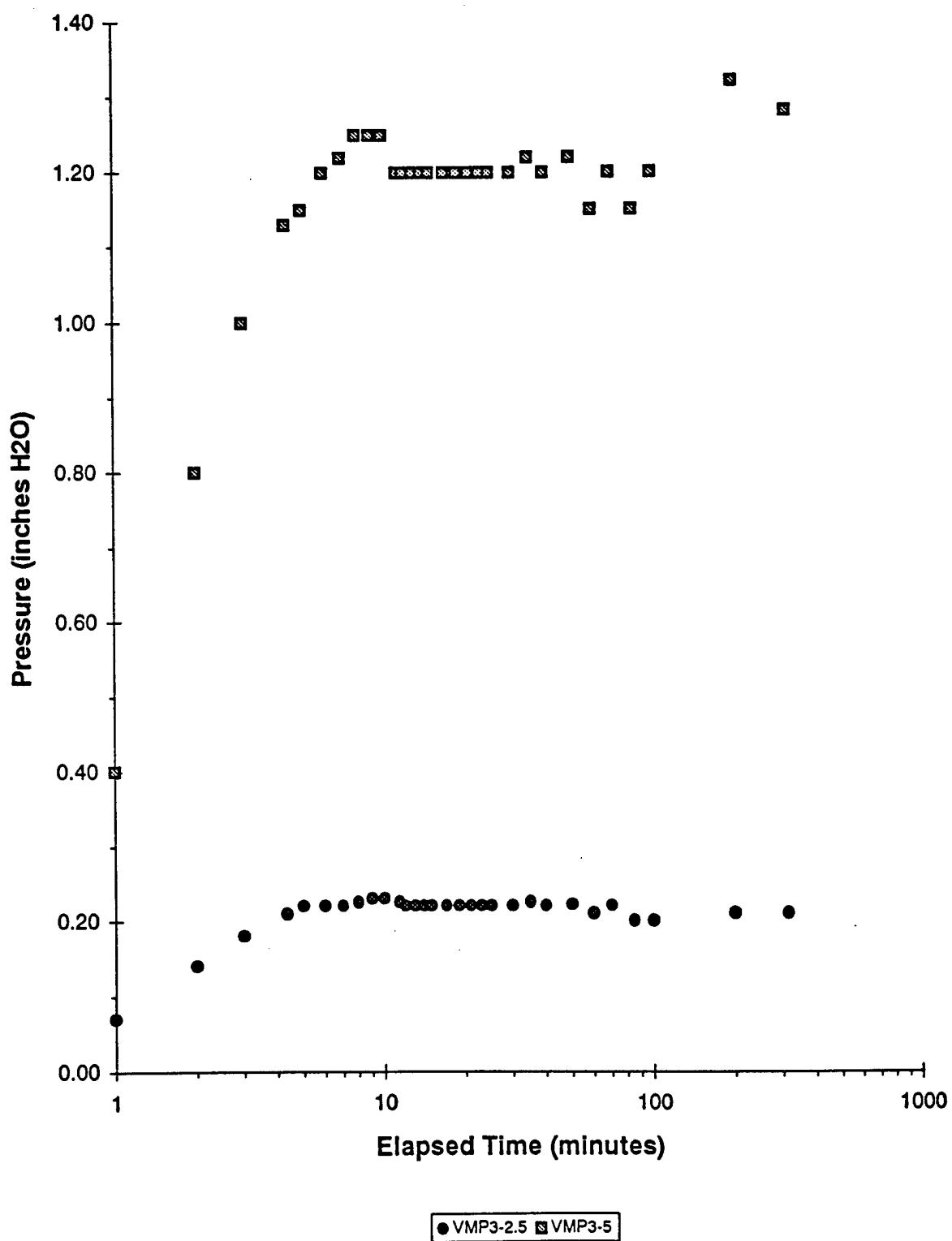


FIGURE D.12

Air Permeability Test
Steady-state Calculation Method
PS-1B - Fairchild AFB, Washington

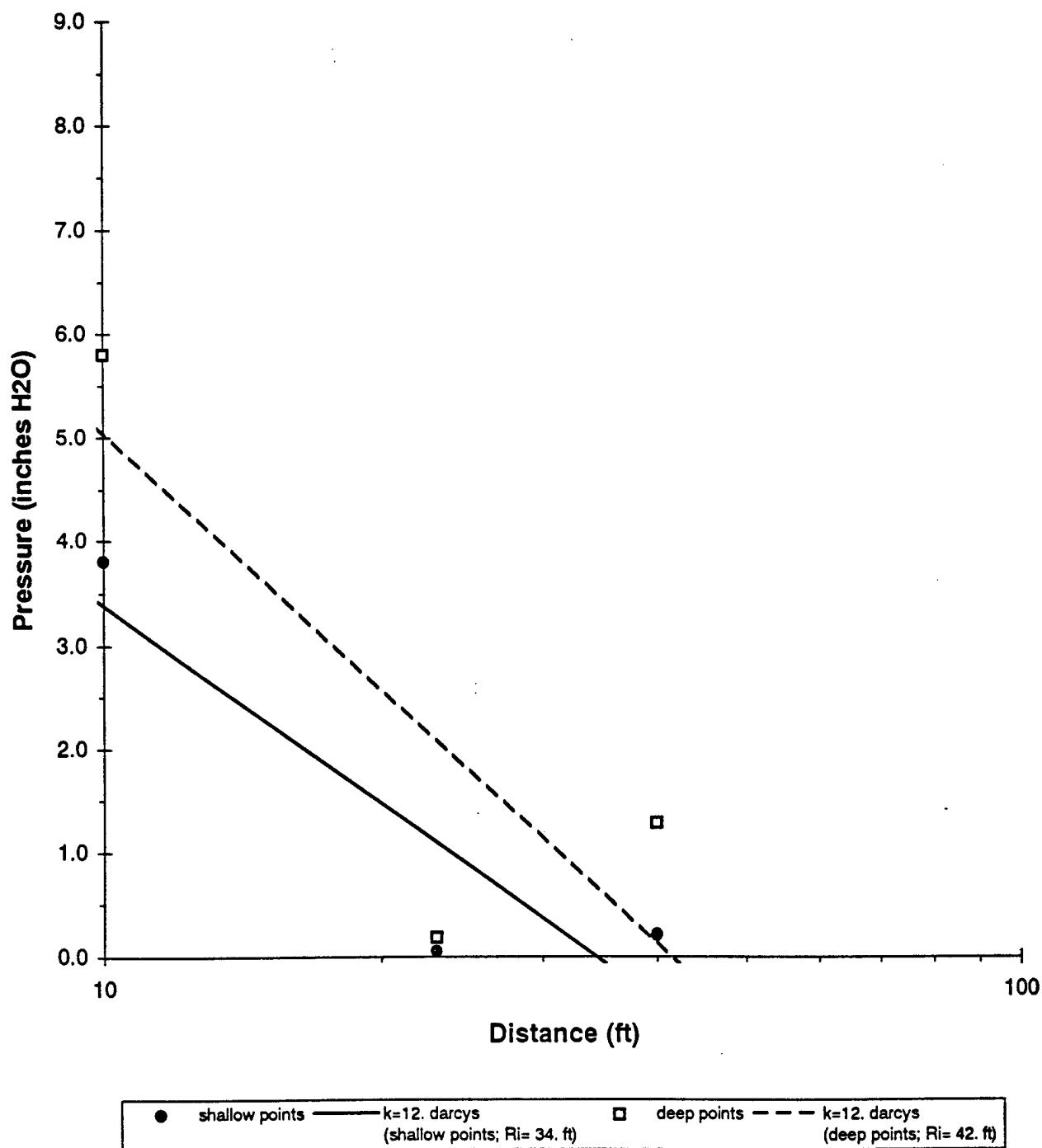
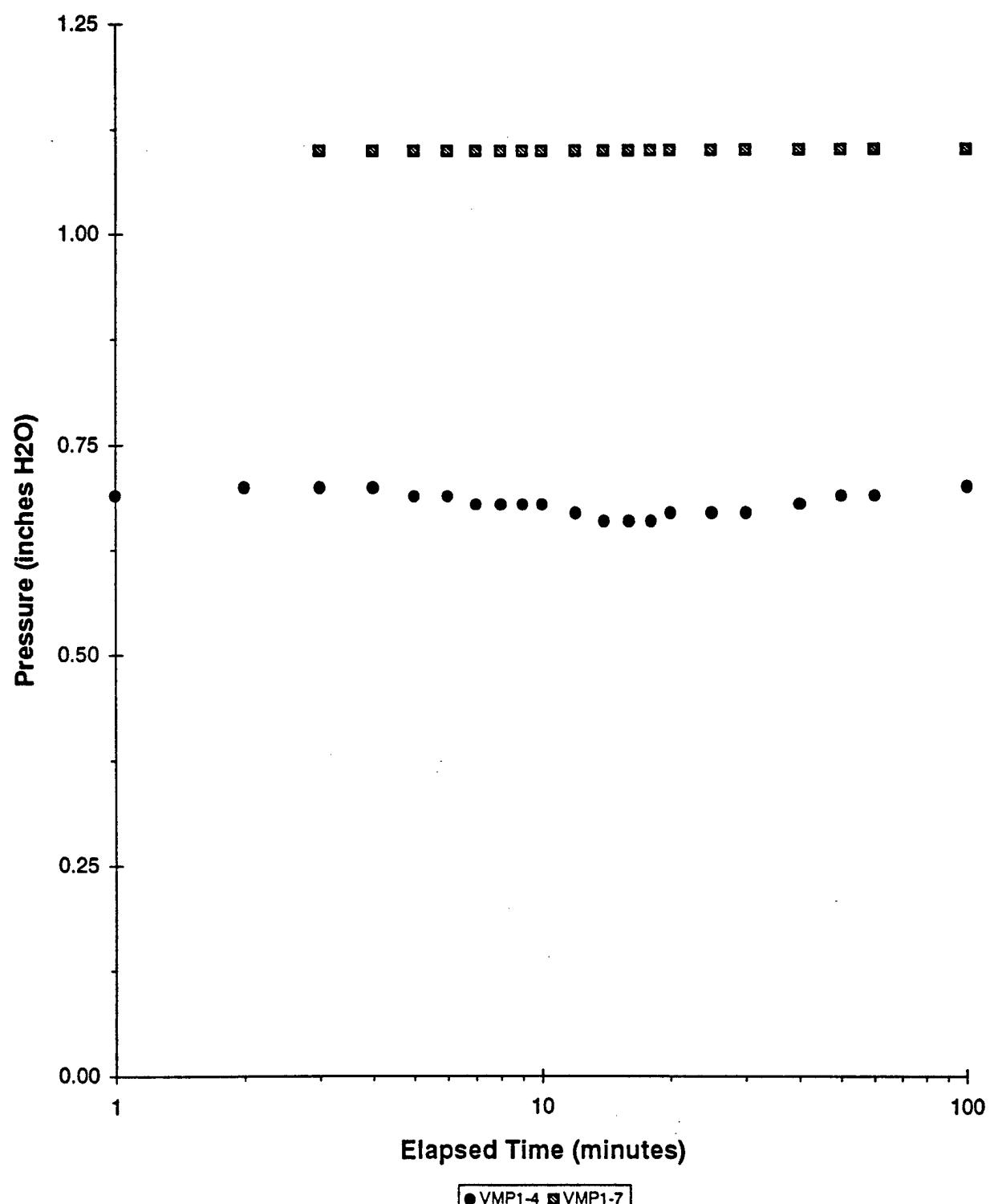


FIGURE D.13

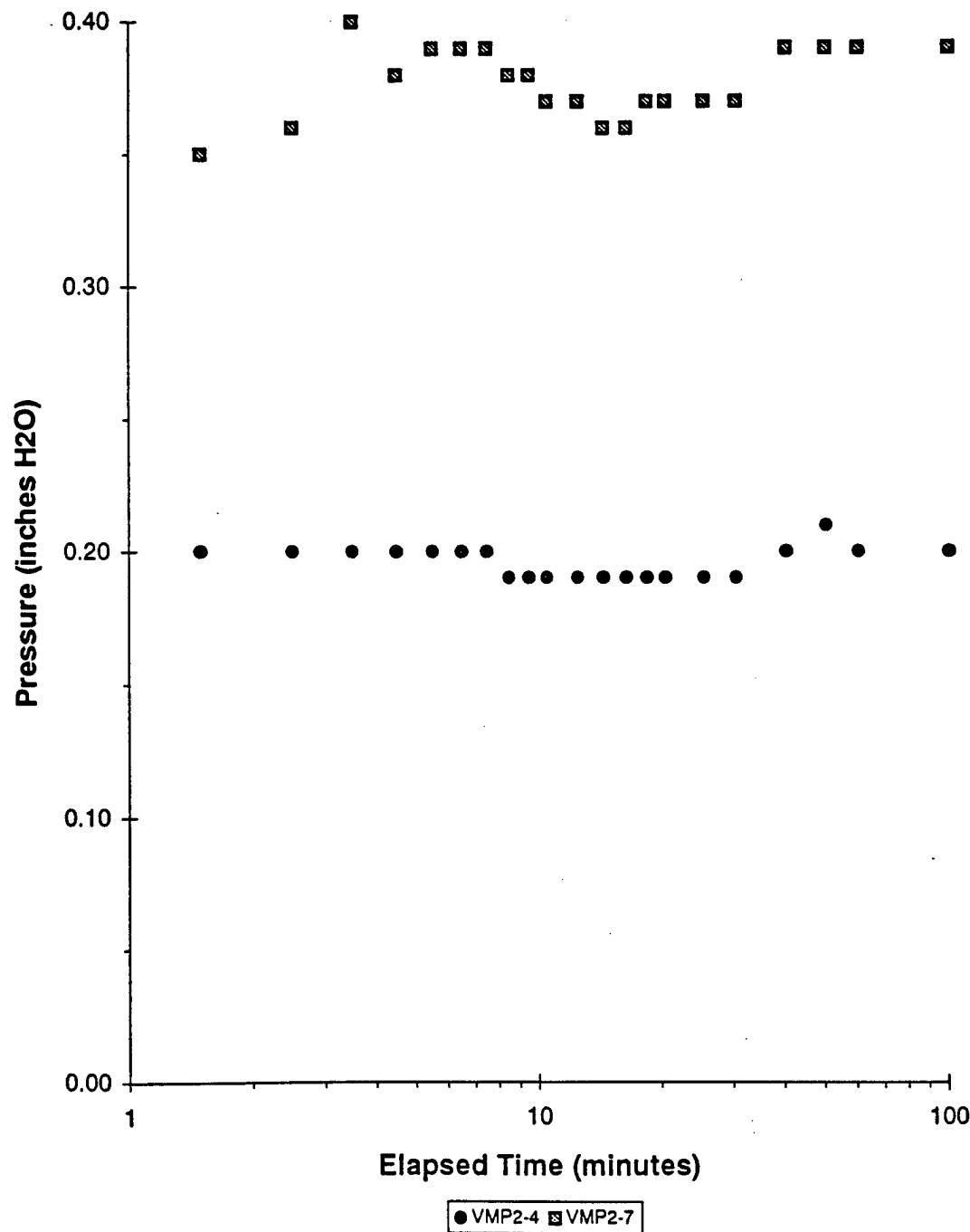
Air Permeability Test
VMP1-4 & VMP1-7; radius = 10 feet
Bldg 2034 - Fairchild AFB, Washington



ENGINEERING-SCIENCE, INC.

FIGURE D.14

Air Permeability Test
VMP2-4 & VMP2-7; radius = 20 ft
Bldg 2034 - Fairchild AFB, Washington



Air Permeability Test
VMP3-5 & VMP3-8.5; radius = 32.5 feet
Bldg 2034 - Fairchild AFB, Washington

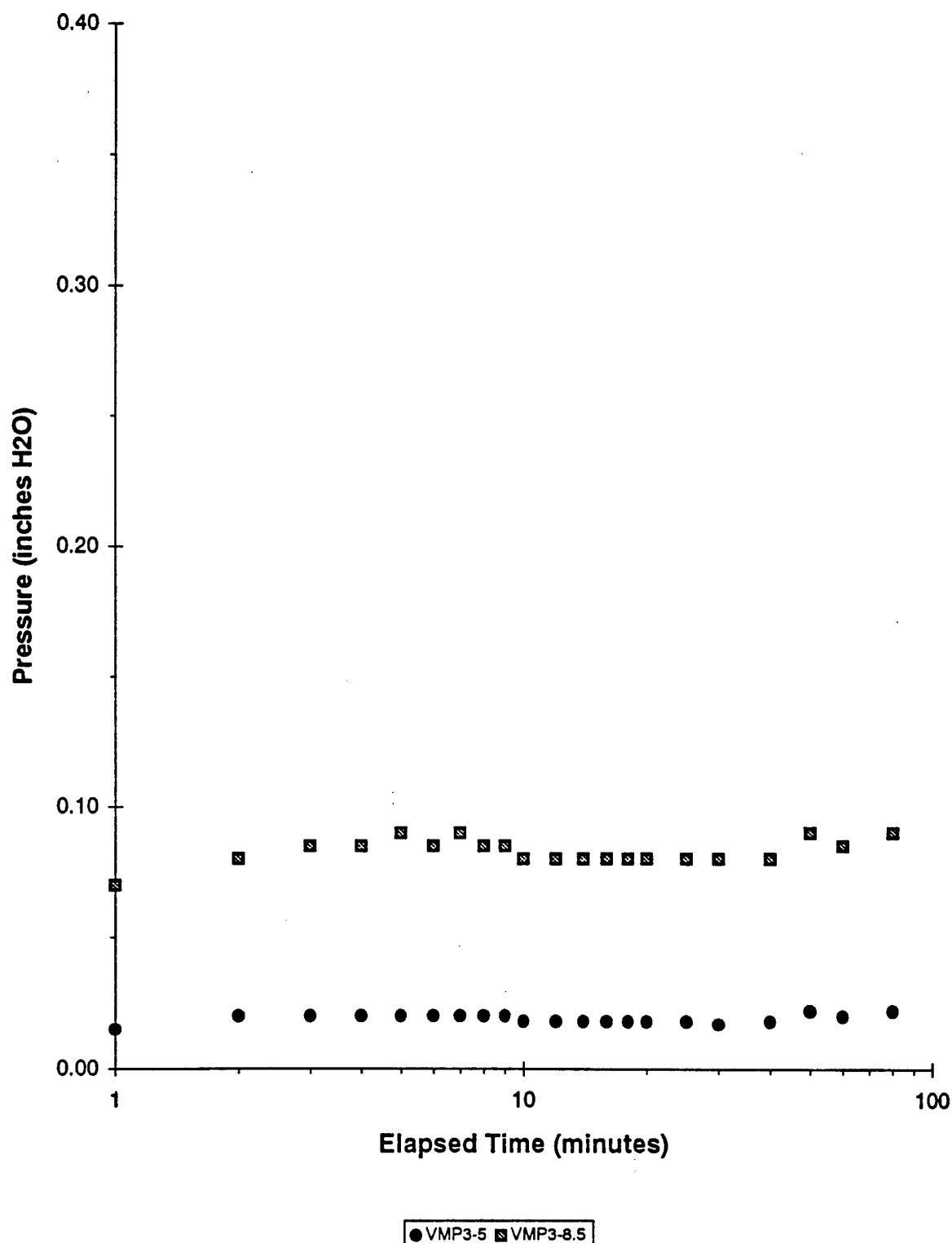


FIGURE D.16

**Air Permeability Test
Steady-state Calculation Method
Bldg 2034 - Fairchild AFB, Washington**

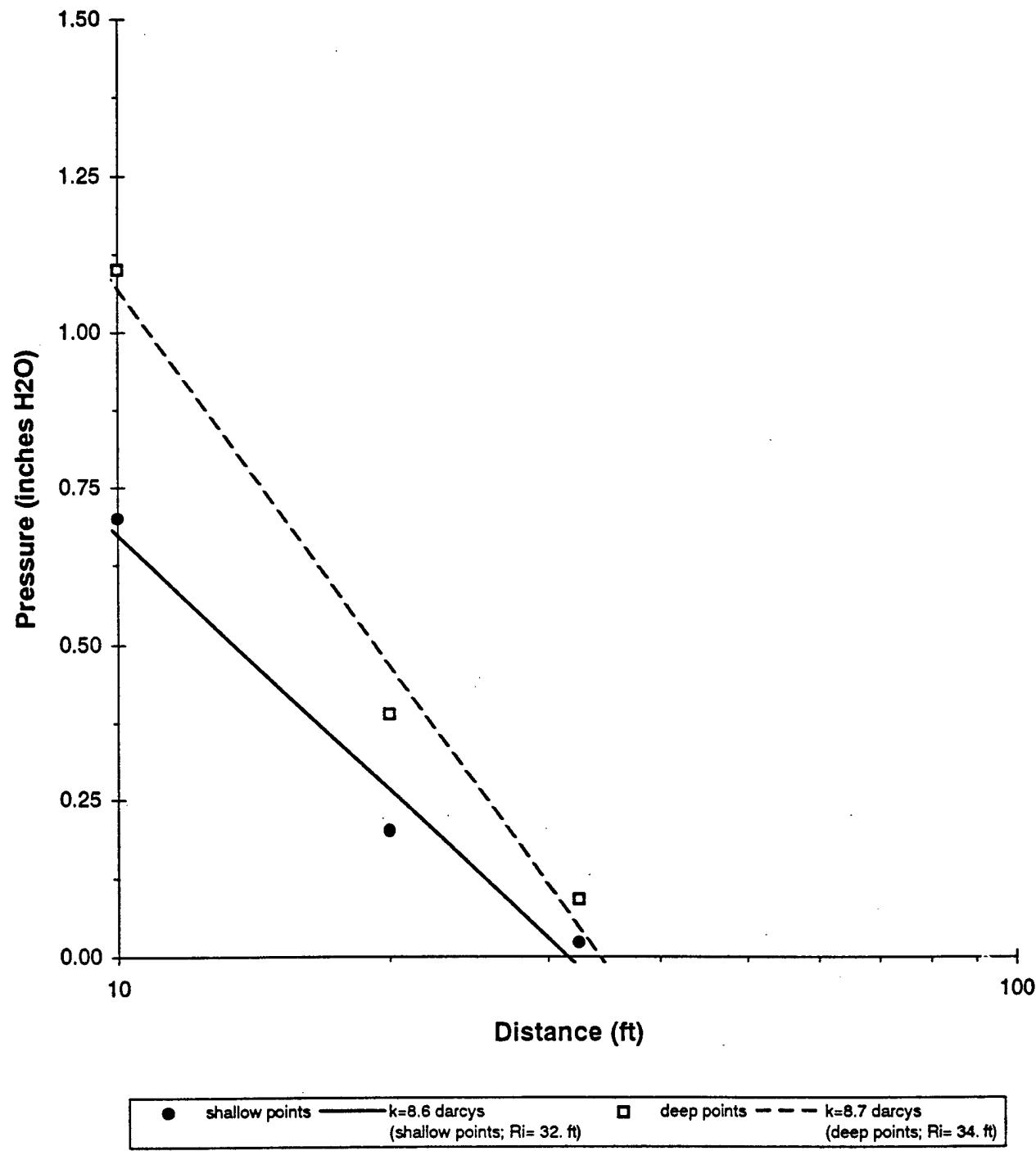


FIGURE D.17

**Air Permeability Test
VMP1-5 & VMP1-7.5; radius = 10 feet
Bldg 2035 - Fairchild AFB, Washington**

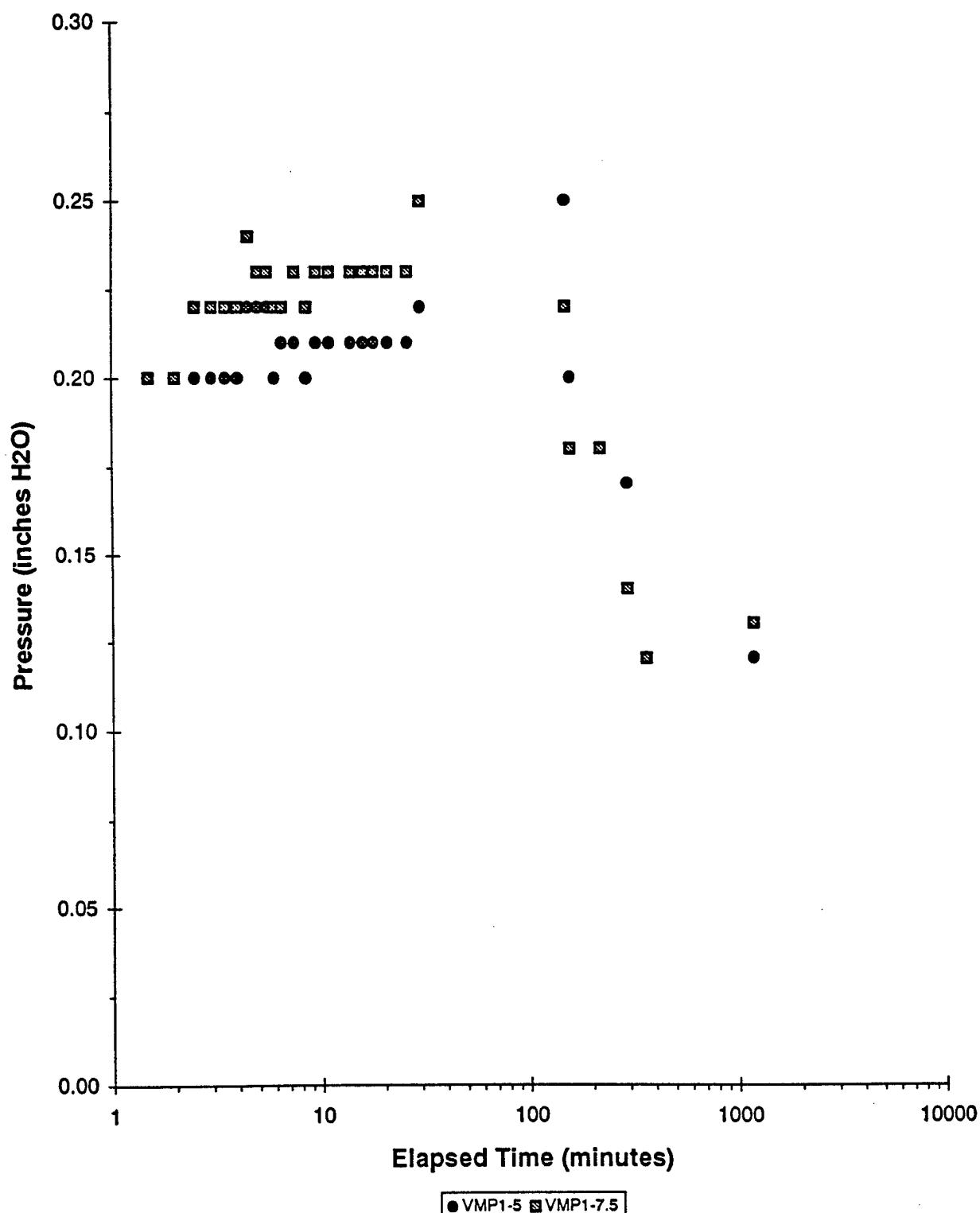


FIGURE D.18

Air Permeability Test
VMP2-5 & VMP2-7.5; radius = 16 ft
Bldg 2035 - Fairchild AFB, Washington

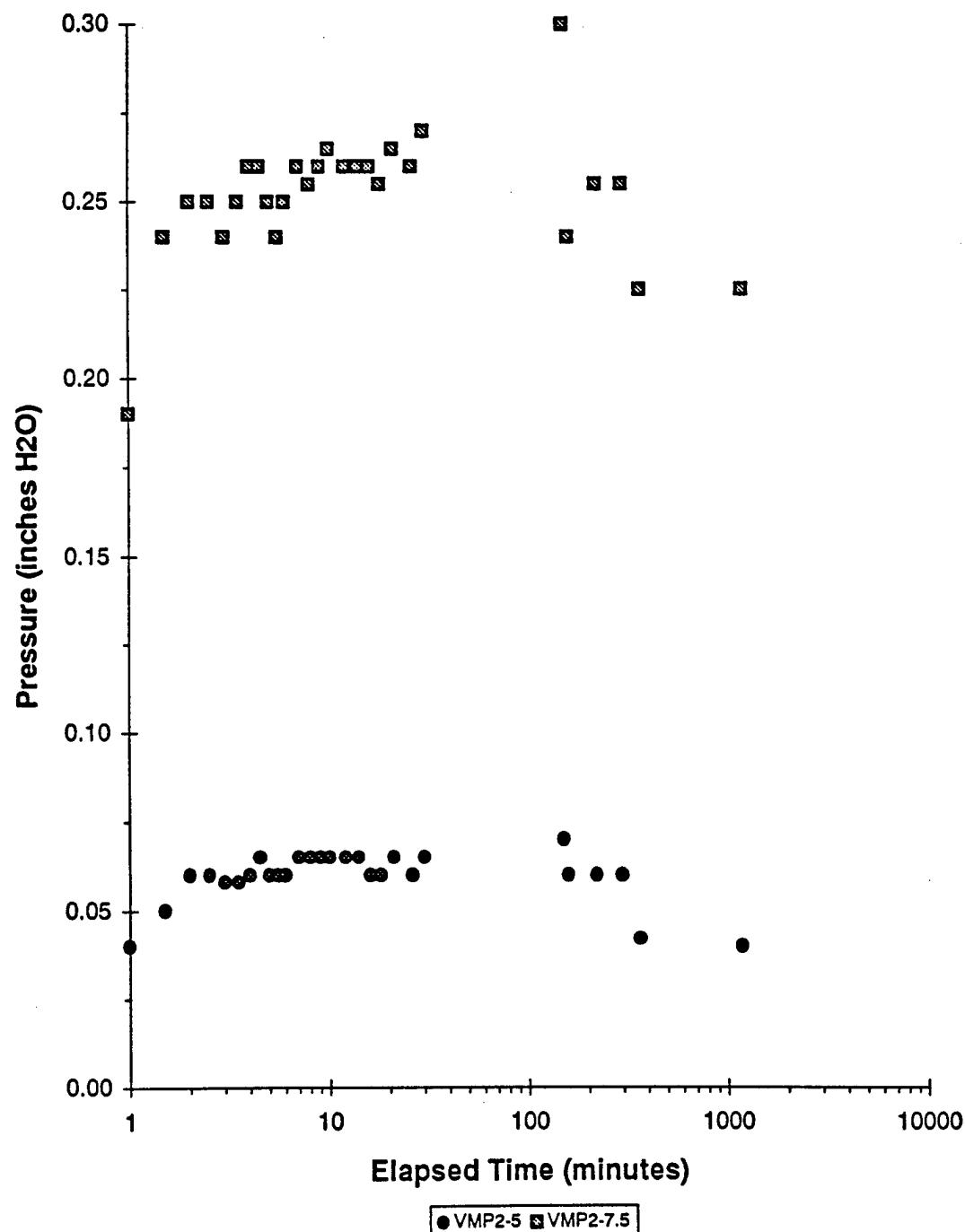


FIGURE D.19

Air Permeability Test
VMP3-5 & VMP3-7.5; radius = 33 feet
Bldg 2035 - Fairchild AFB, Washington

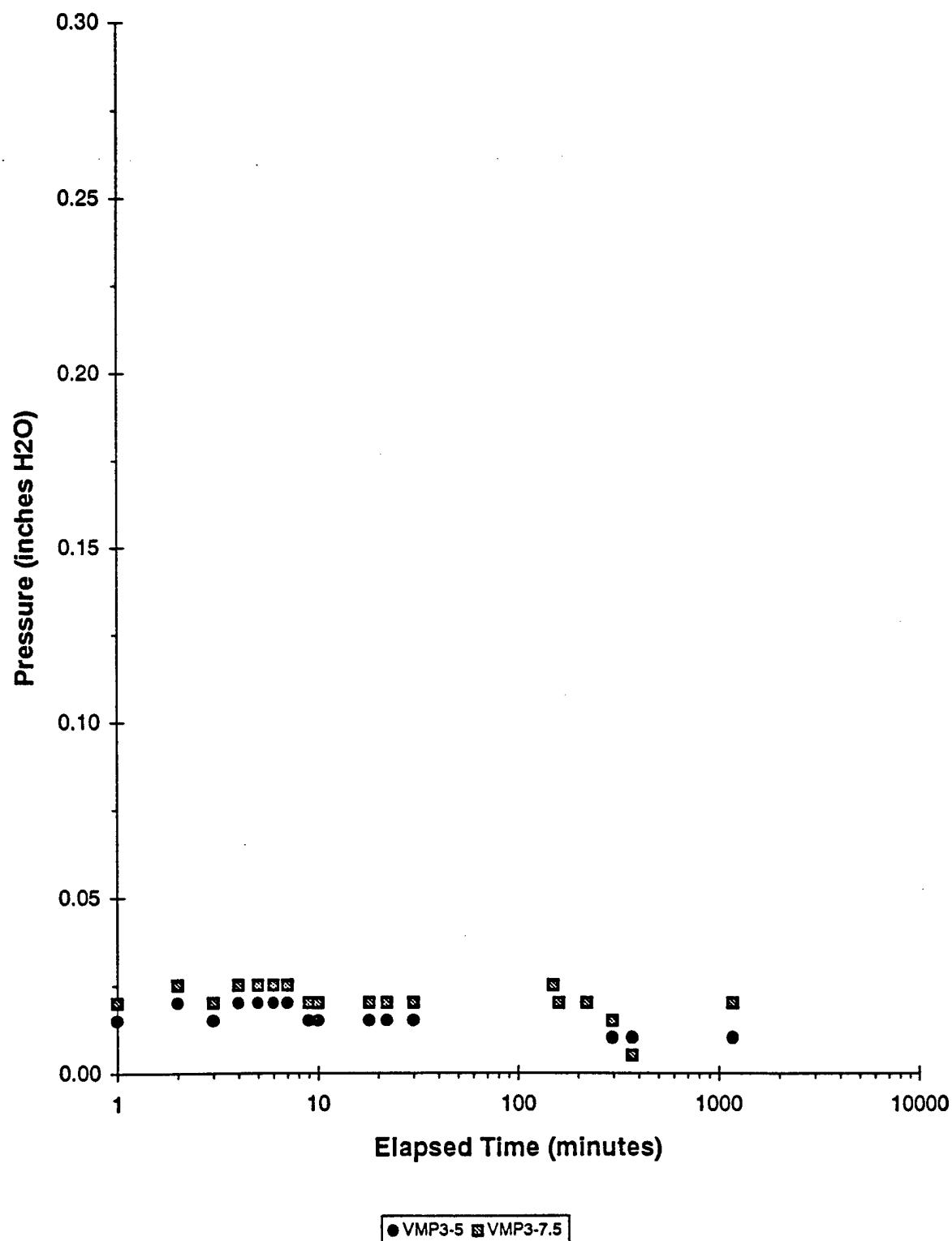
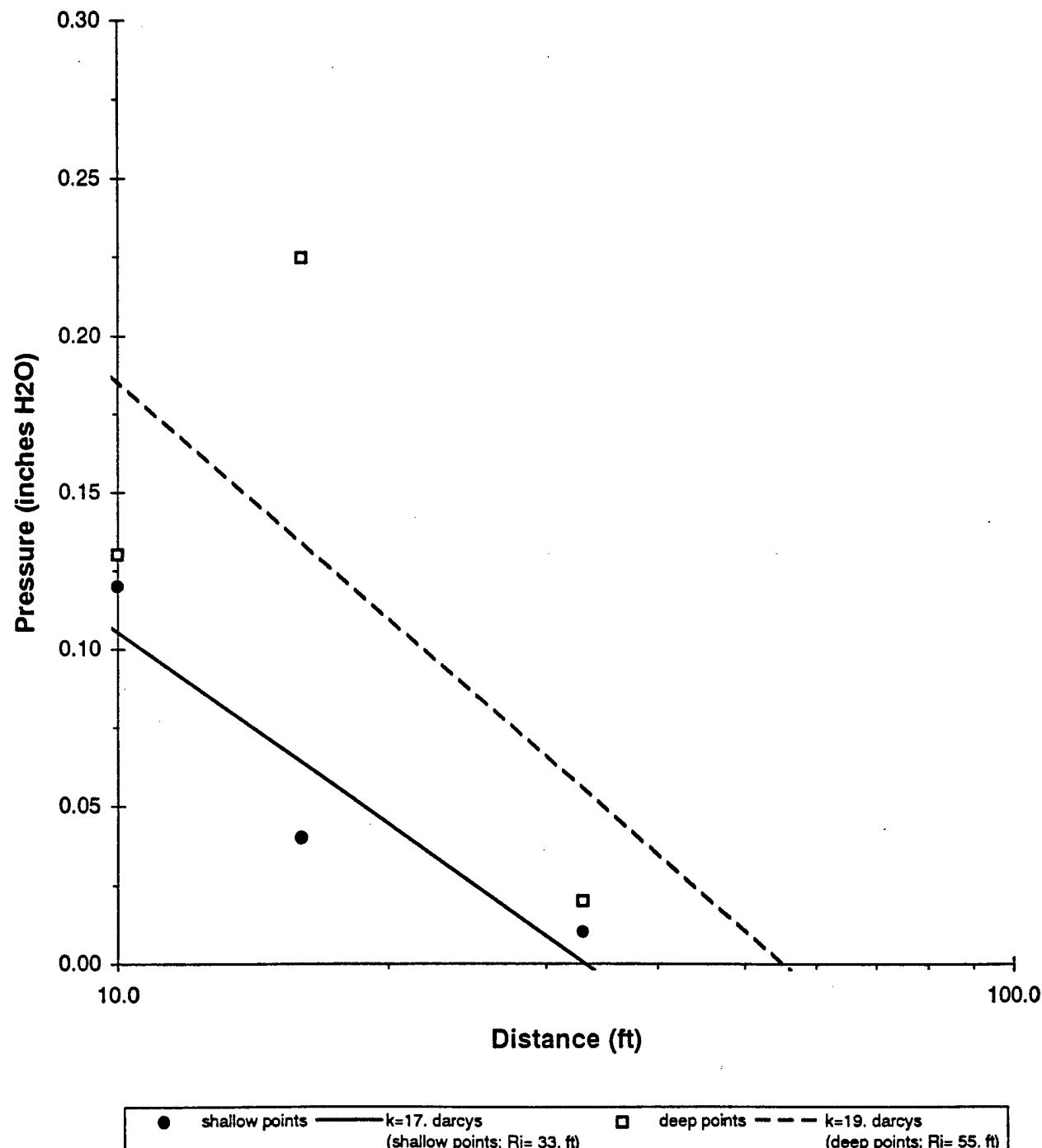


FIGURE D.20

Air Permeability Test
Steady-state Calculation Method
Bldg 2035 - Fairchild AFB, Washington



APPENDIX E

IN SITU RESPIRATION TEST RESULTS

FIGURE E.1

Respiration Test at VMP1-4
PS-2 - Fairchild AFB, WA

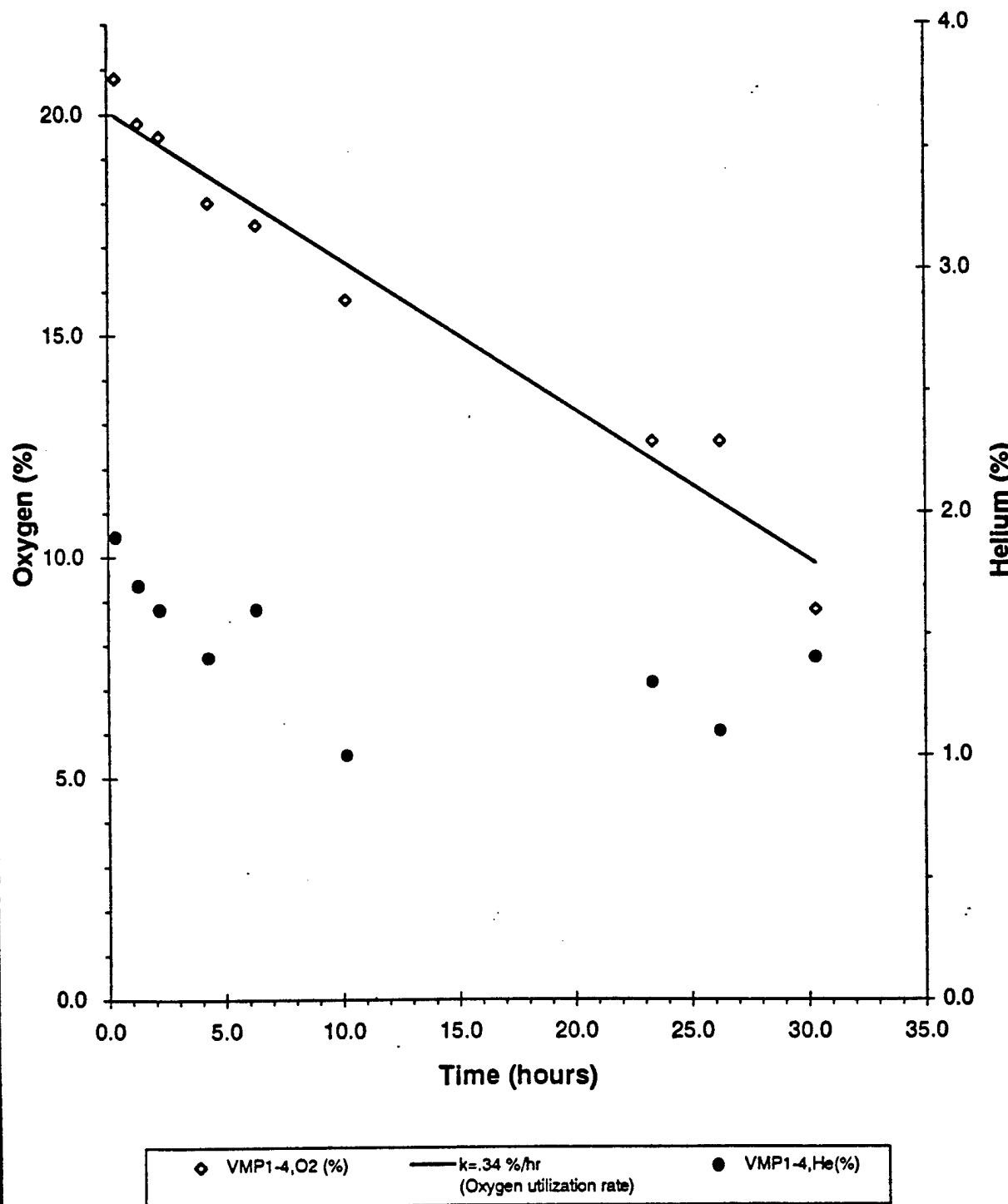


FIGURE E.2

Respiration Test at VMP1-7.5
PS-2 - Fairchild AFB, WA

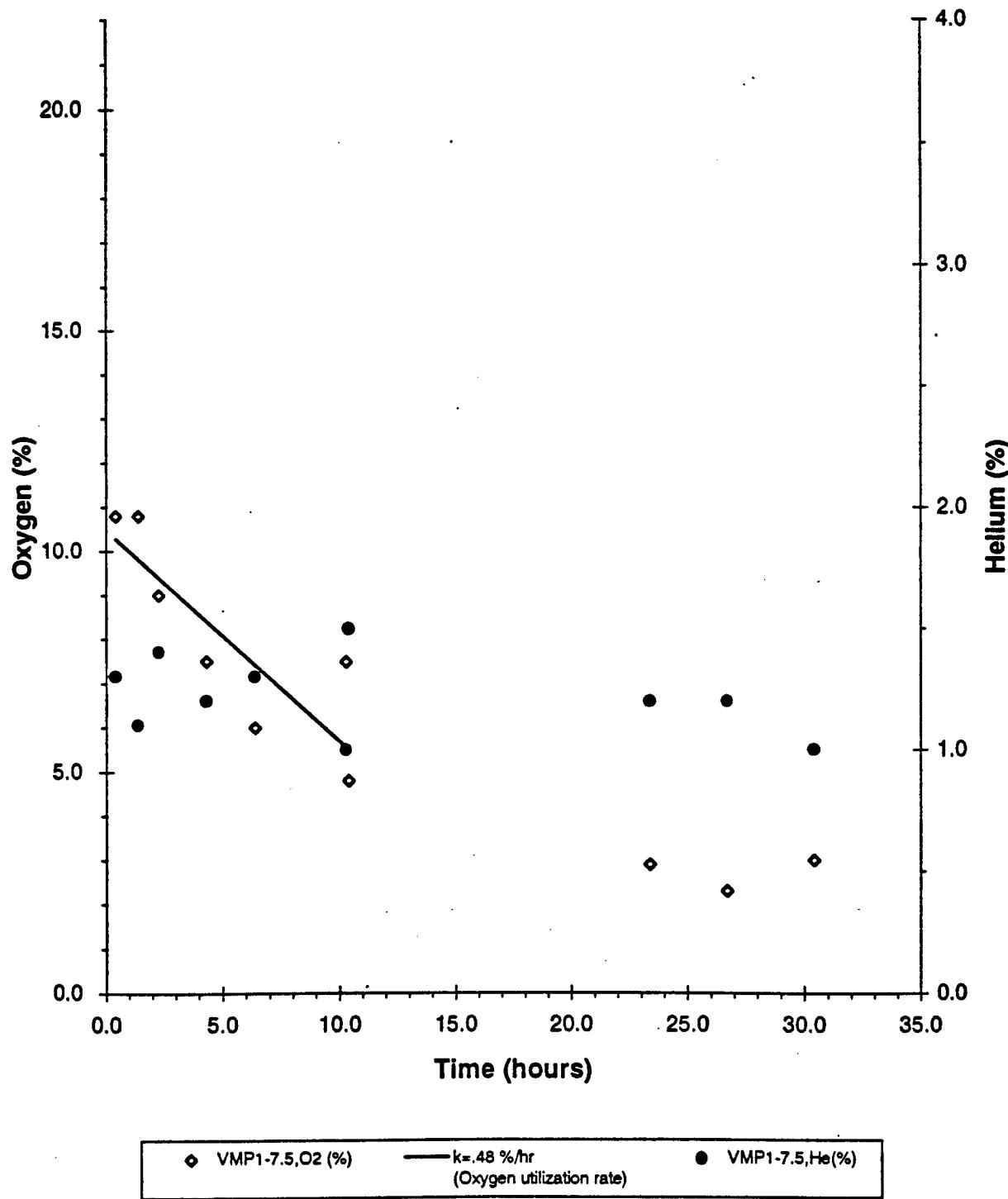


FIGURE E.3

Respiration Test at VMP2-4
PS-2 - Fairchild AFB, WA

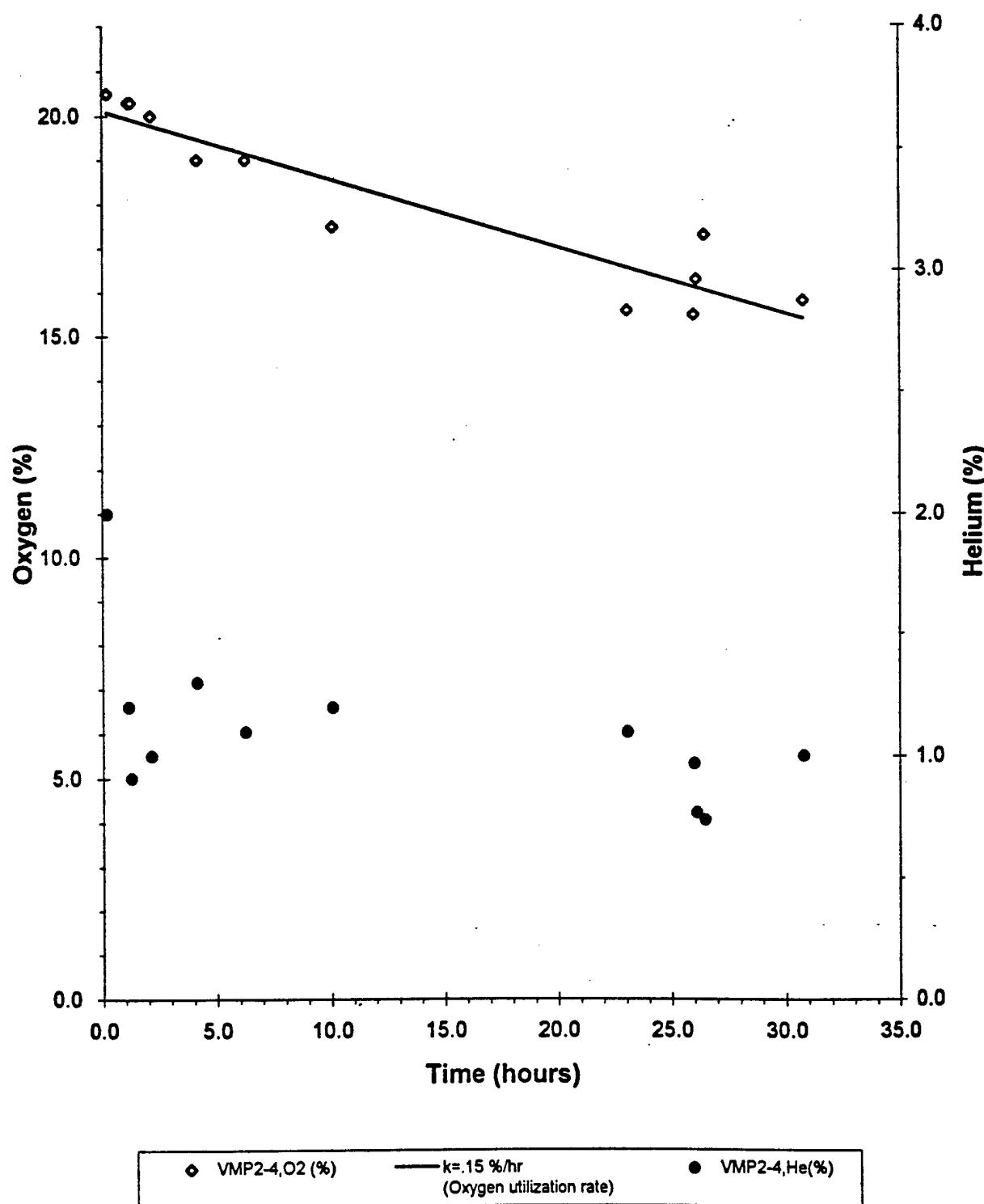


FIGURE E.4

Respiration Test at VMP2-6.5
PS-2 - Fairchild AFB, WA

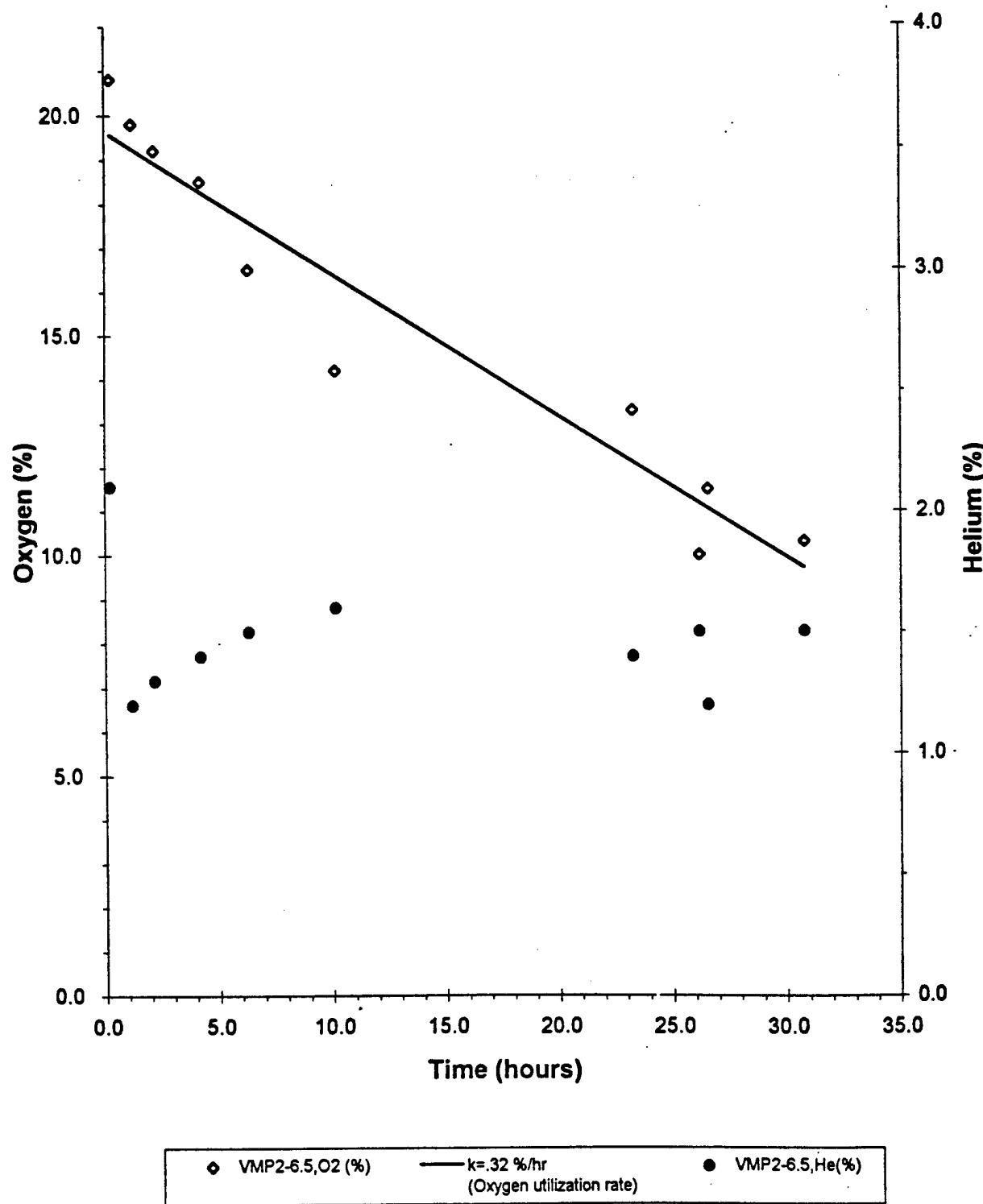


FIGURE E.5

Respiration Test at VMP3-4
PS-2 - Fairchild AFB, WA

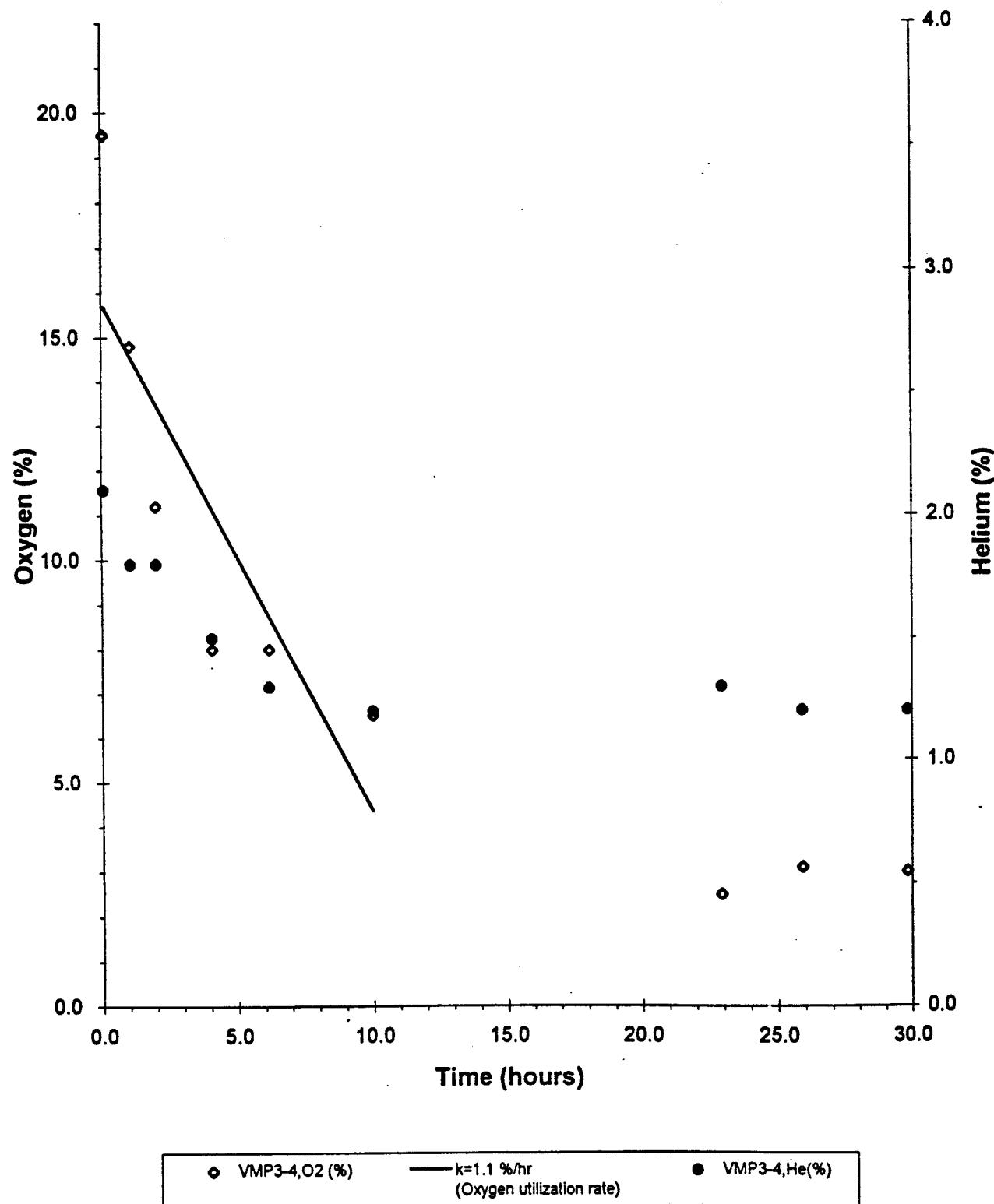


FIGURE E.6

Respiration Test at VMP3-7
PS-2 - Fairchild AFB, WA

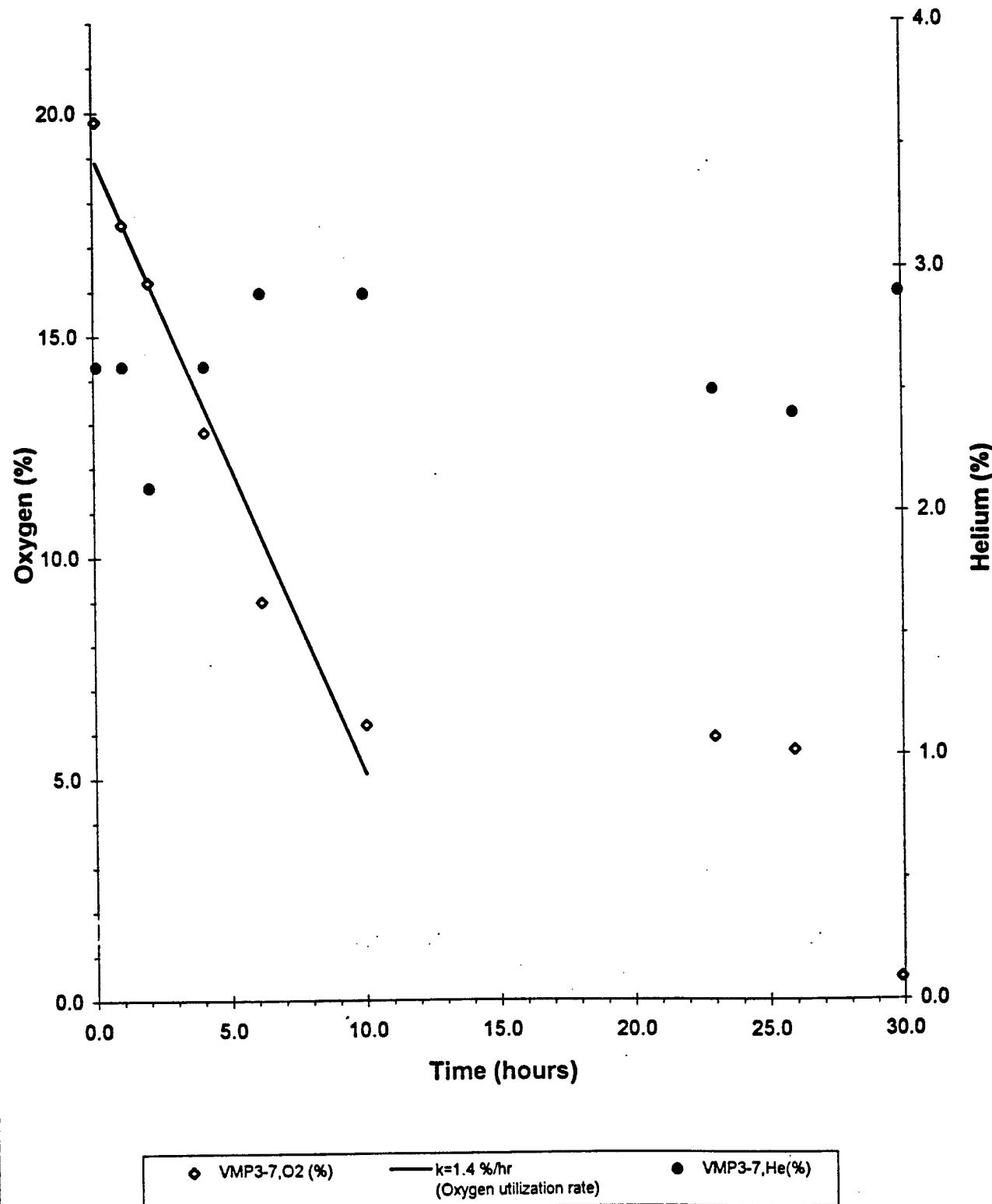


FIGURE E.7

Respiration Test at VW-1
PS-1A - Fairchild AFB, WA

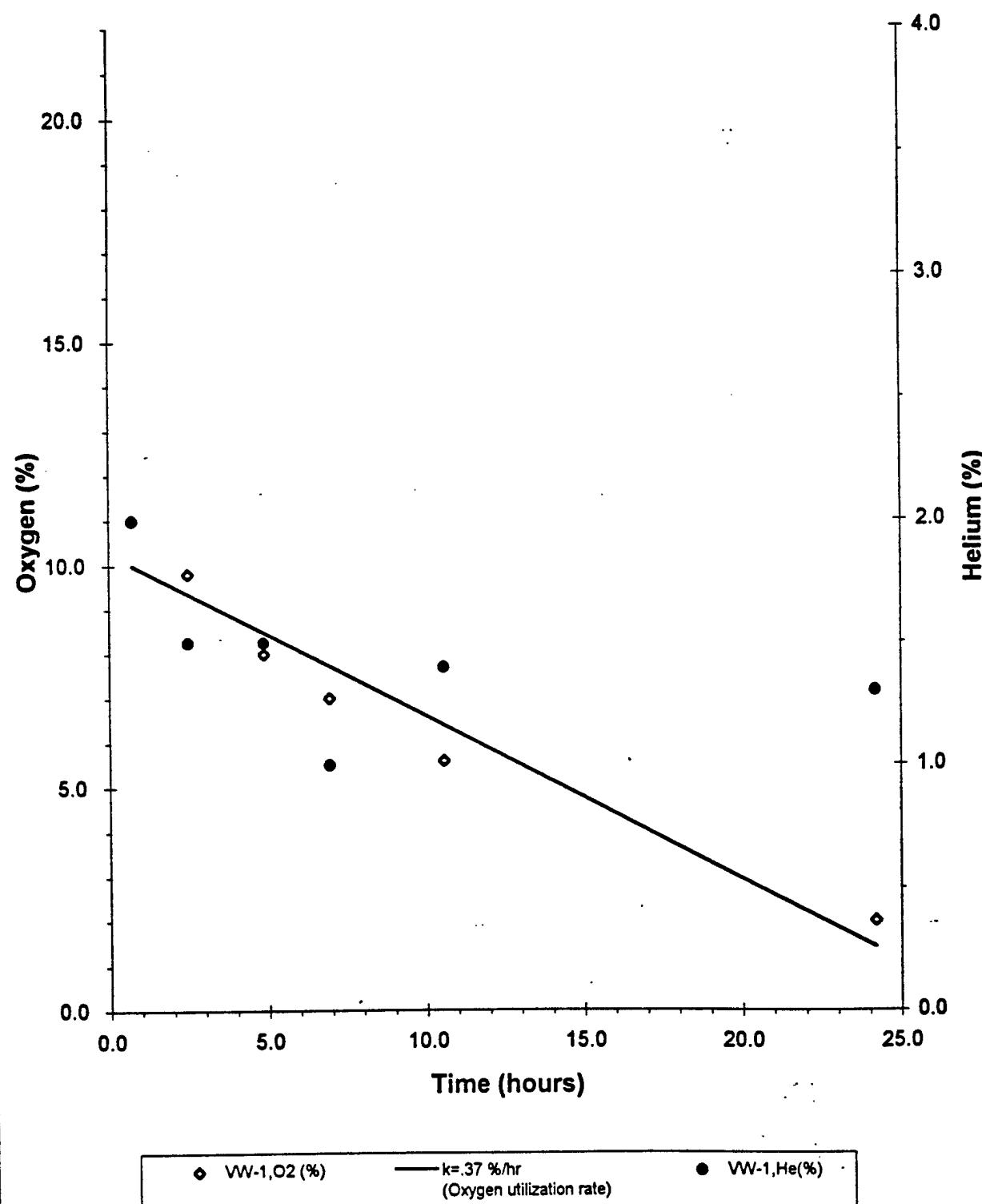


FIGURE E.8

Respiration Test at VMP1-4
PS-1A - Fairchild AFB, WA

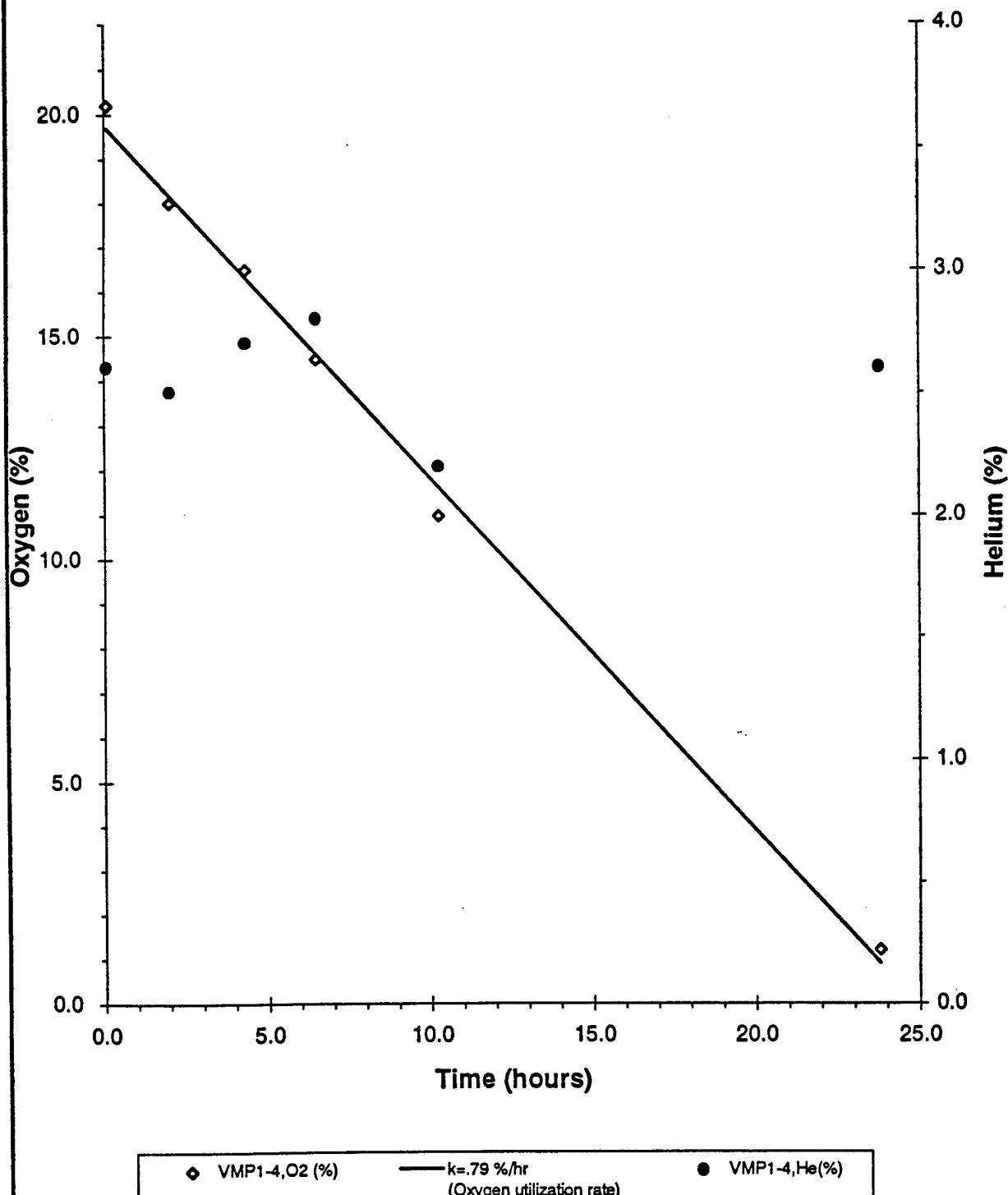


FIGURE E.9

Respiration Test at VMP1-6
PS-1A - Fairchild AFB, WA

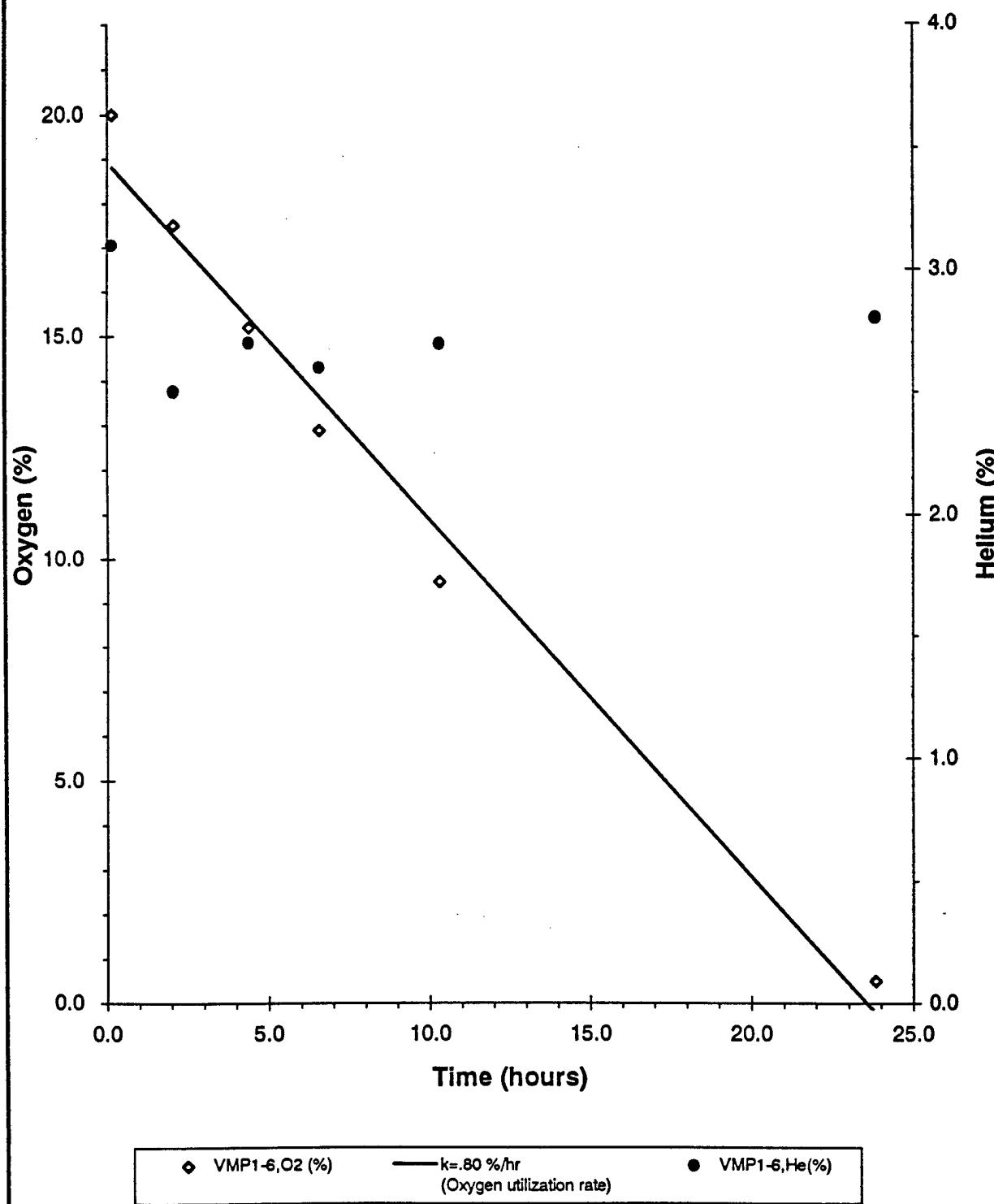


FIGURE E.10

Respiration Test at VMP2-3
PS-1A - Fairchild AFB, WA

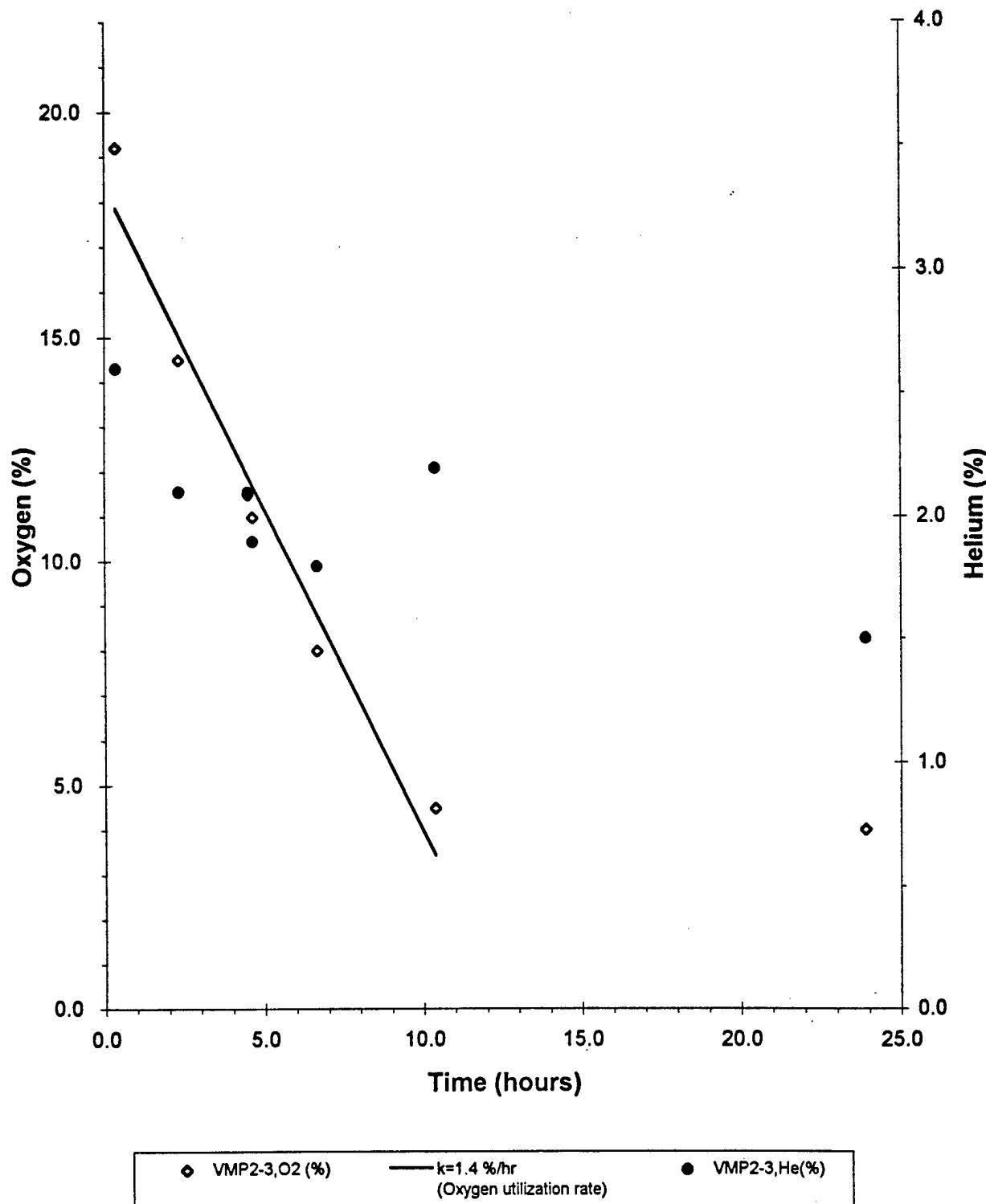
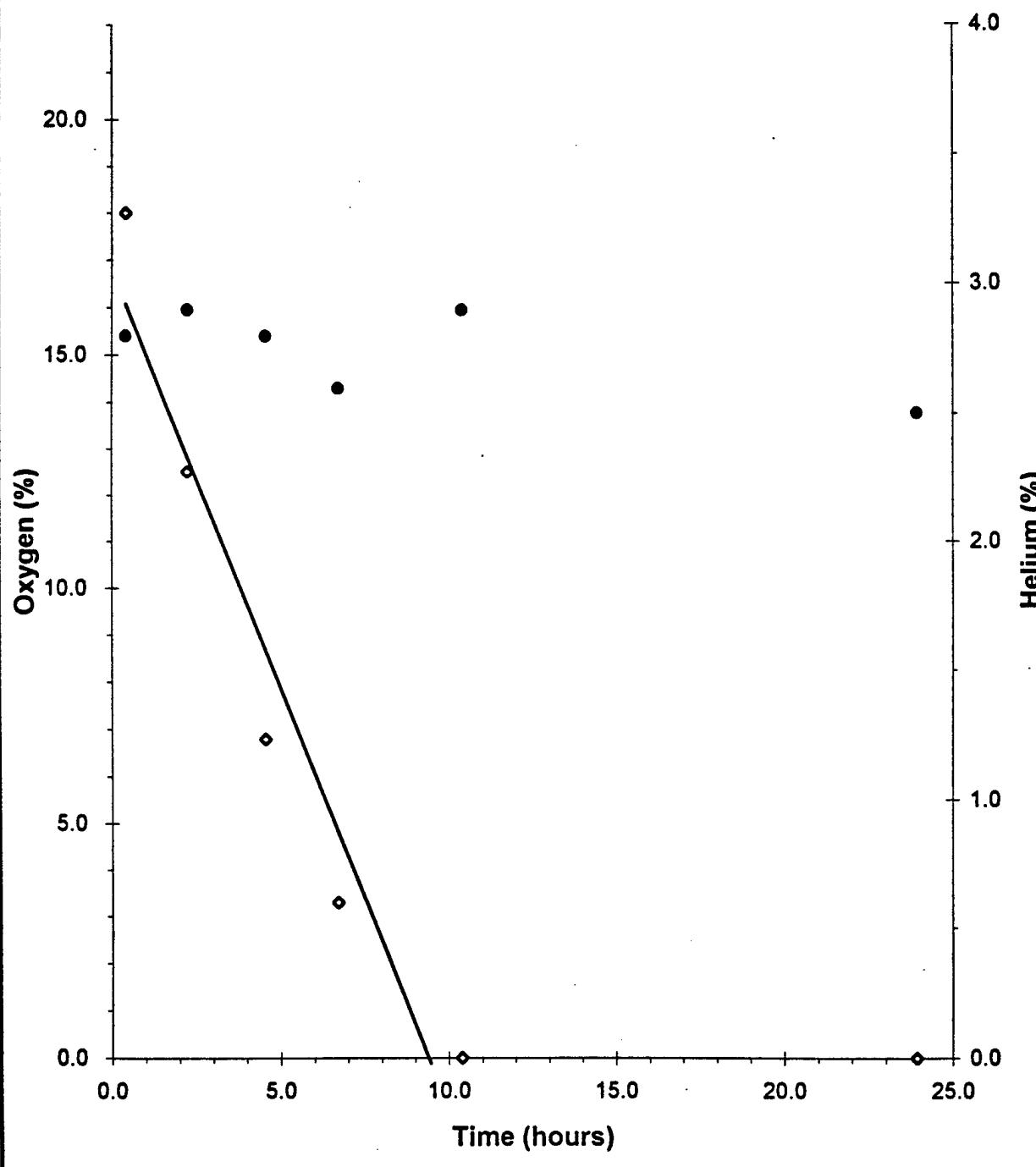


FIGURE E.11

Respiration Test at VMP2-5.5
PS-1A - Fairchild AFB, WA



◆ VMP2-5.5,O2 (%) — k=1.8 %/hr
(Oxygen utilization rate) ● VMP2-5.5,He(%)

FIGURE E.12

Respiration Test at VMP3-5.5
PS-1A - Fairchild AFB, WA

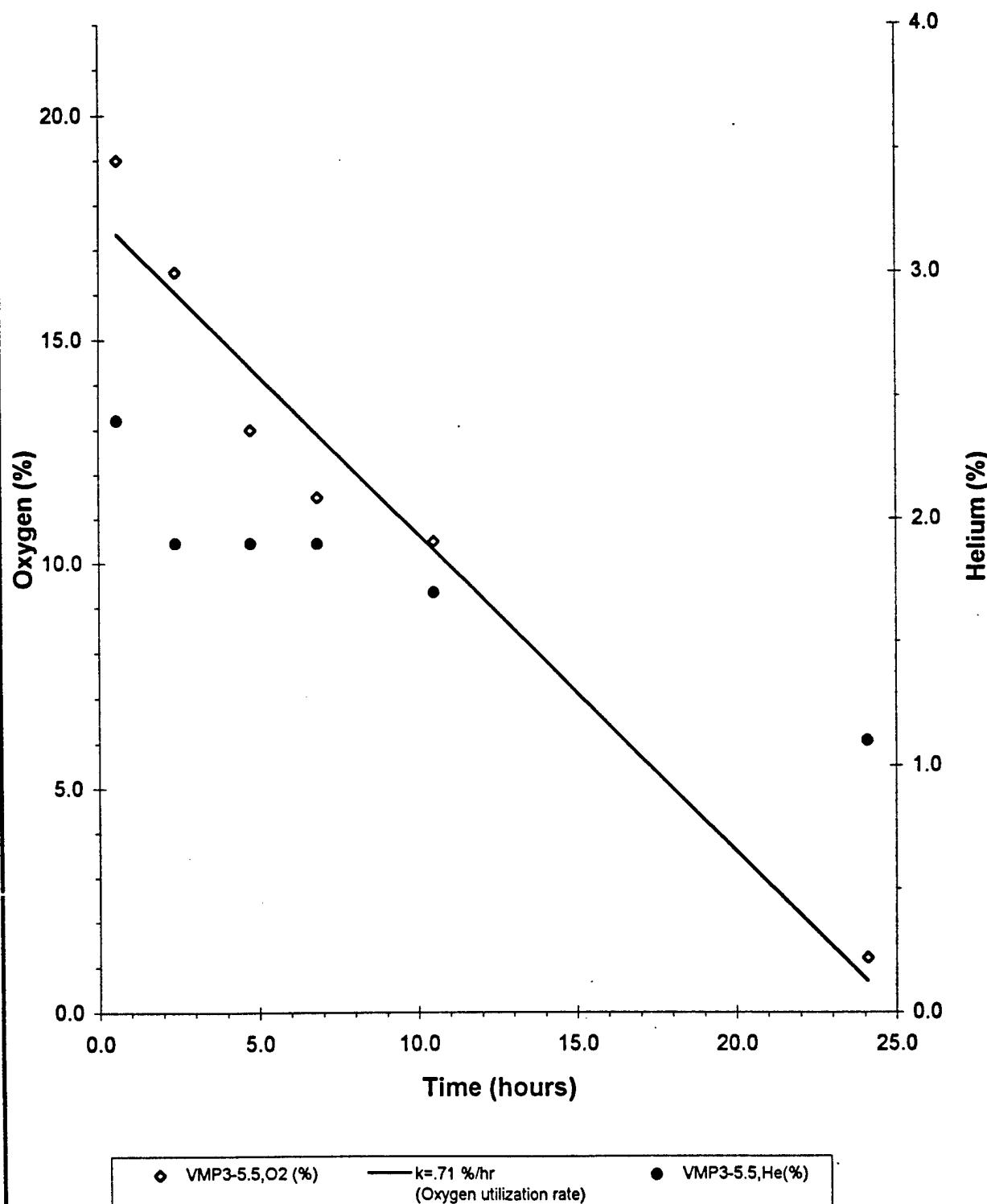


FIGURE E.13

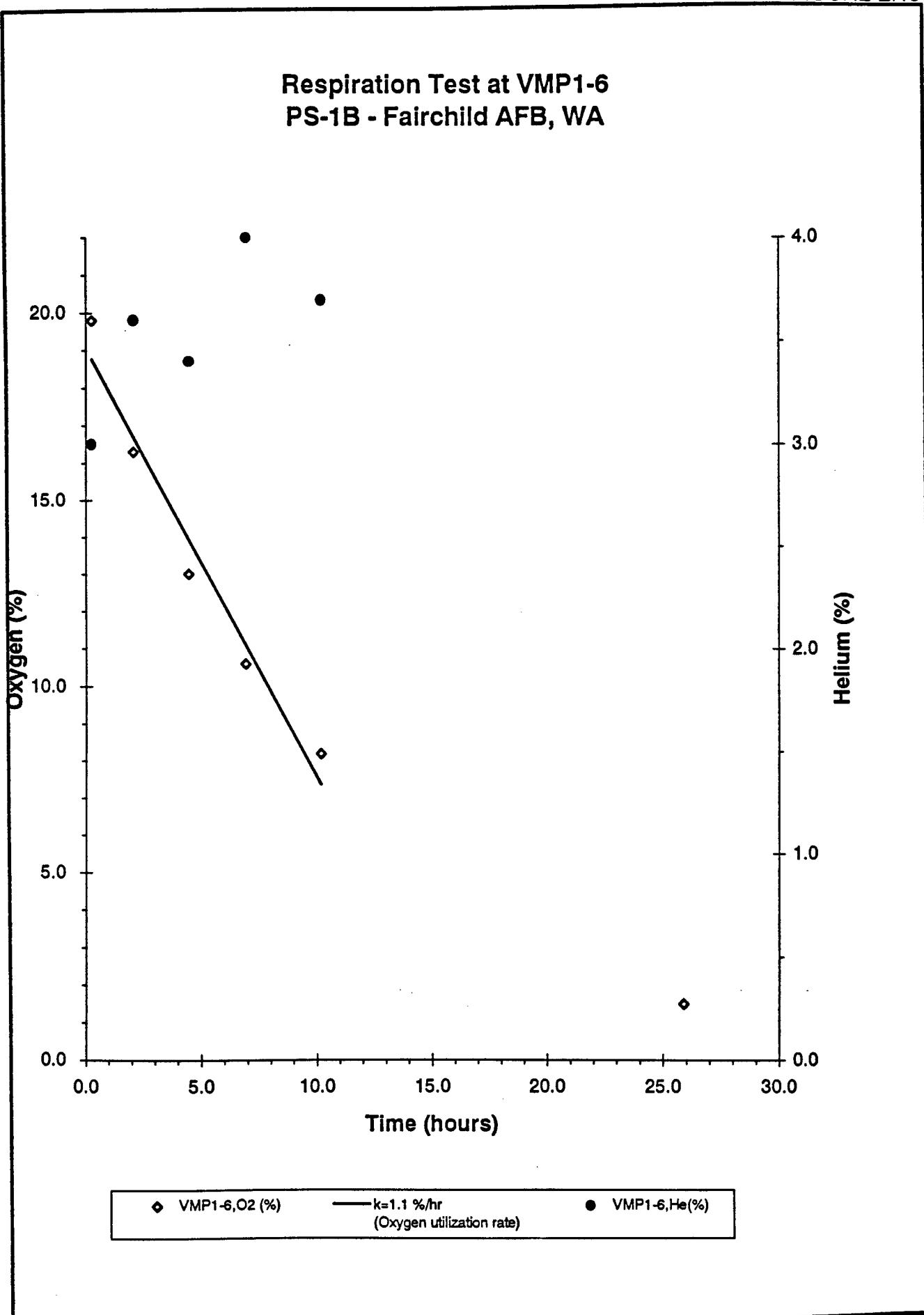


FIGURE E.14

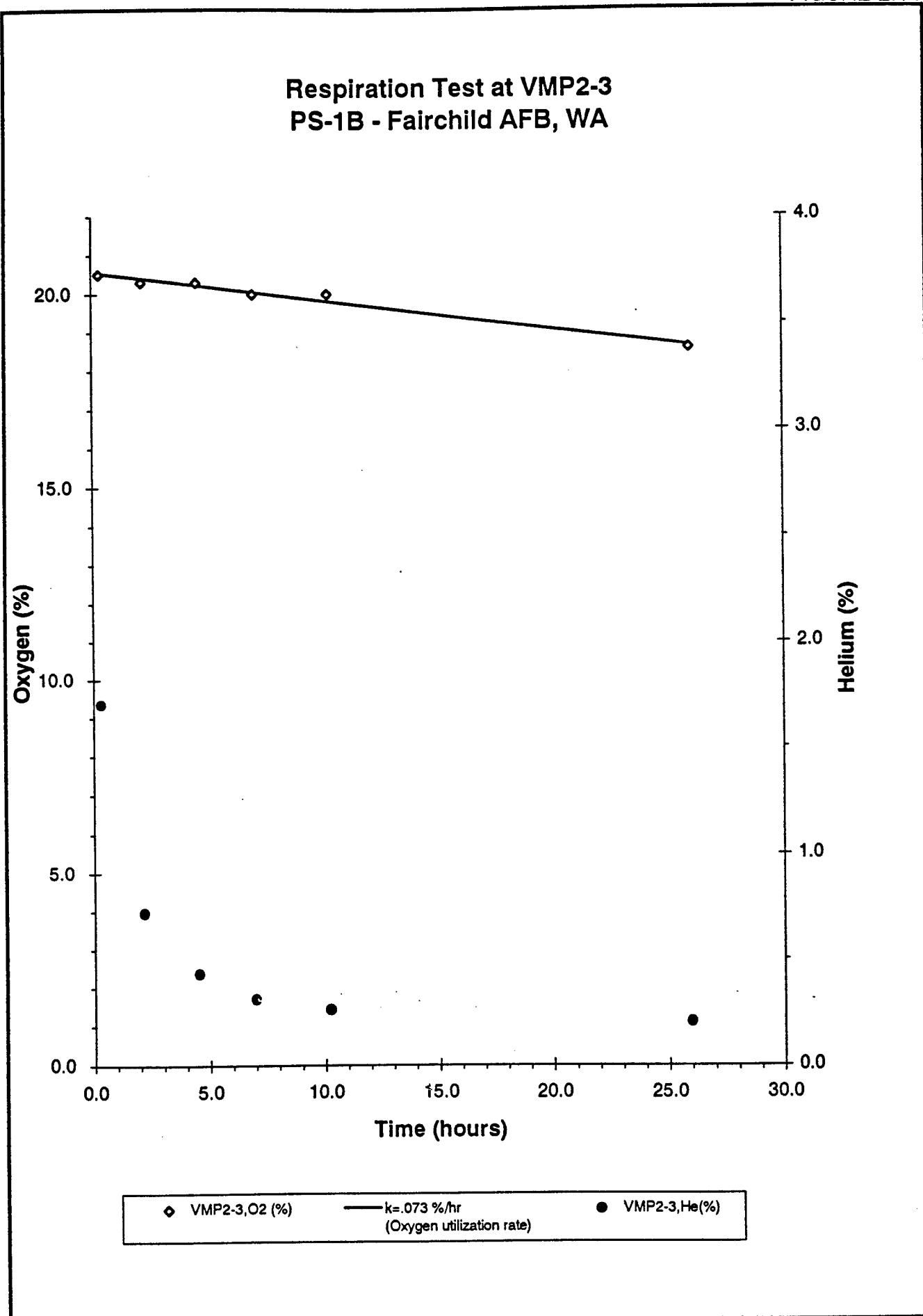


FIGURE E.15

Respiration Test at VMP2-5.5
PS-1B - Fairchild AFB, WA

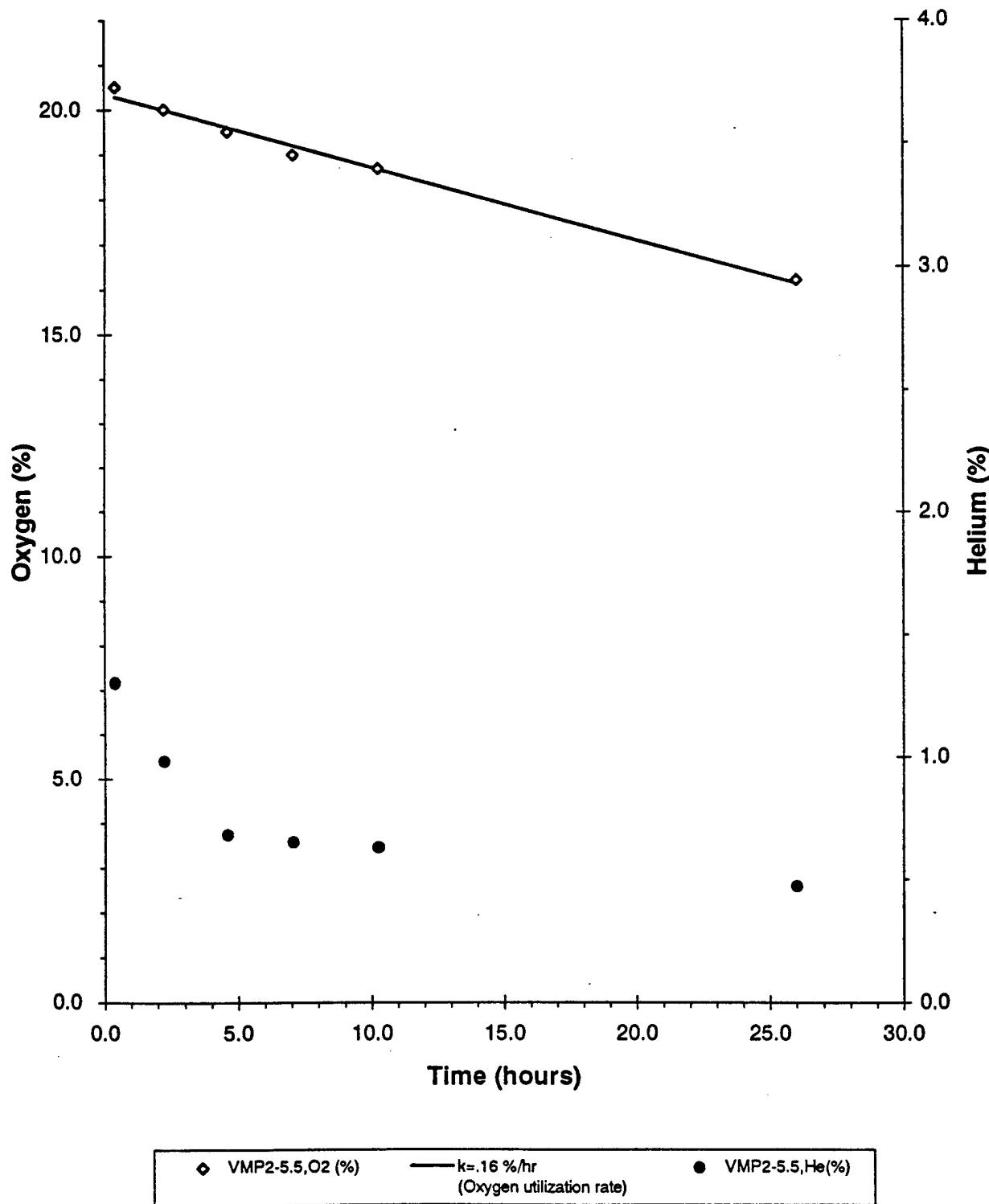


FIGURE E.16

Respiration Test at VMP3-5
PS-1B - Fairchild AFB, WA

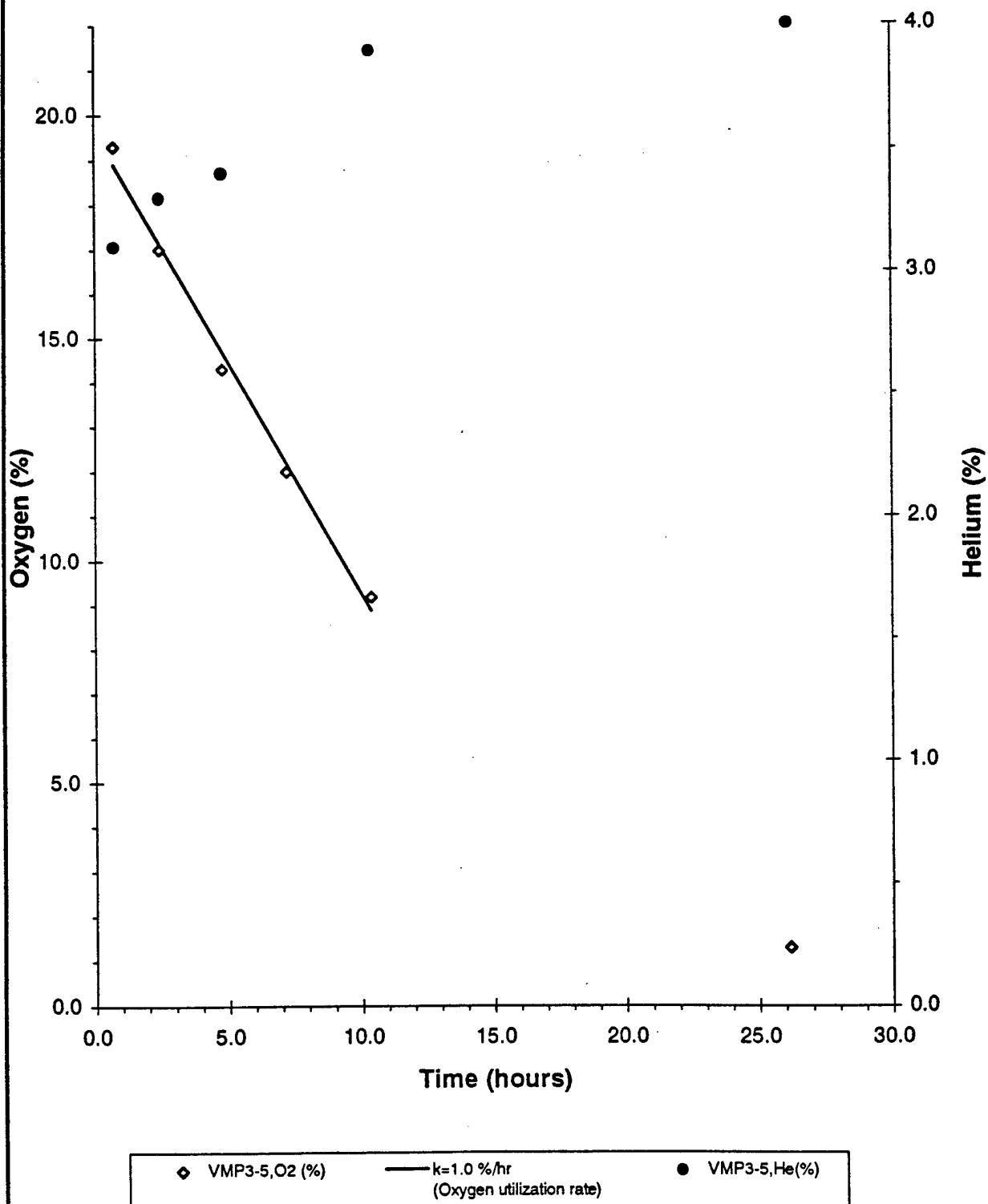


FIGURE E.17

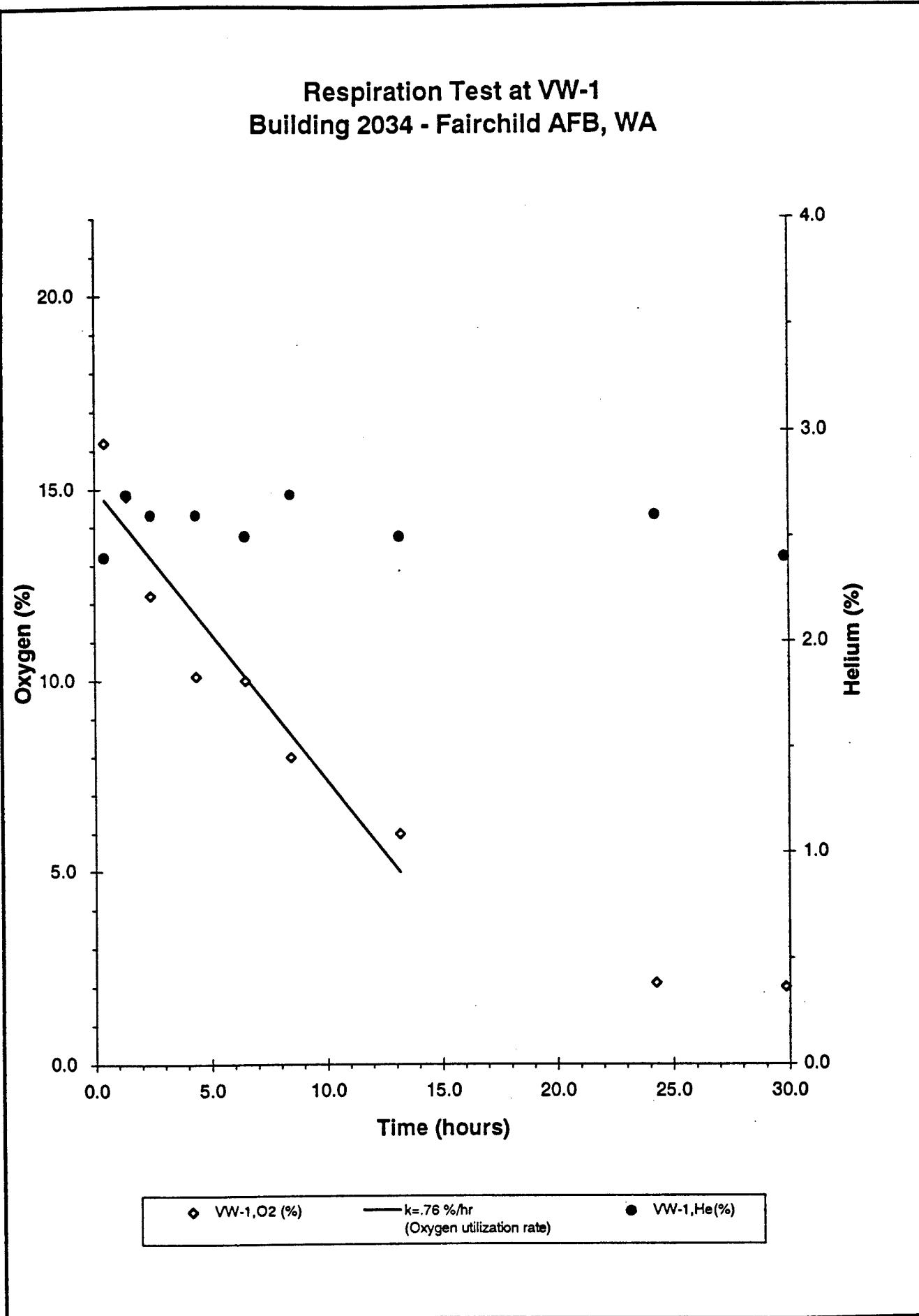


FIGURE E.18

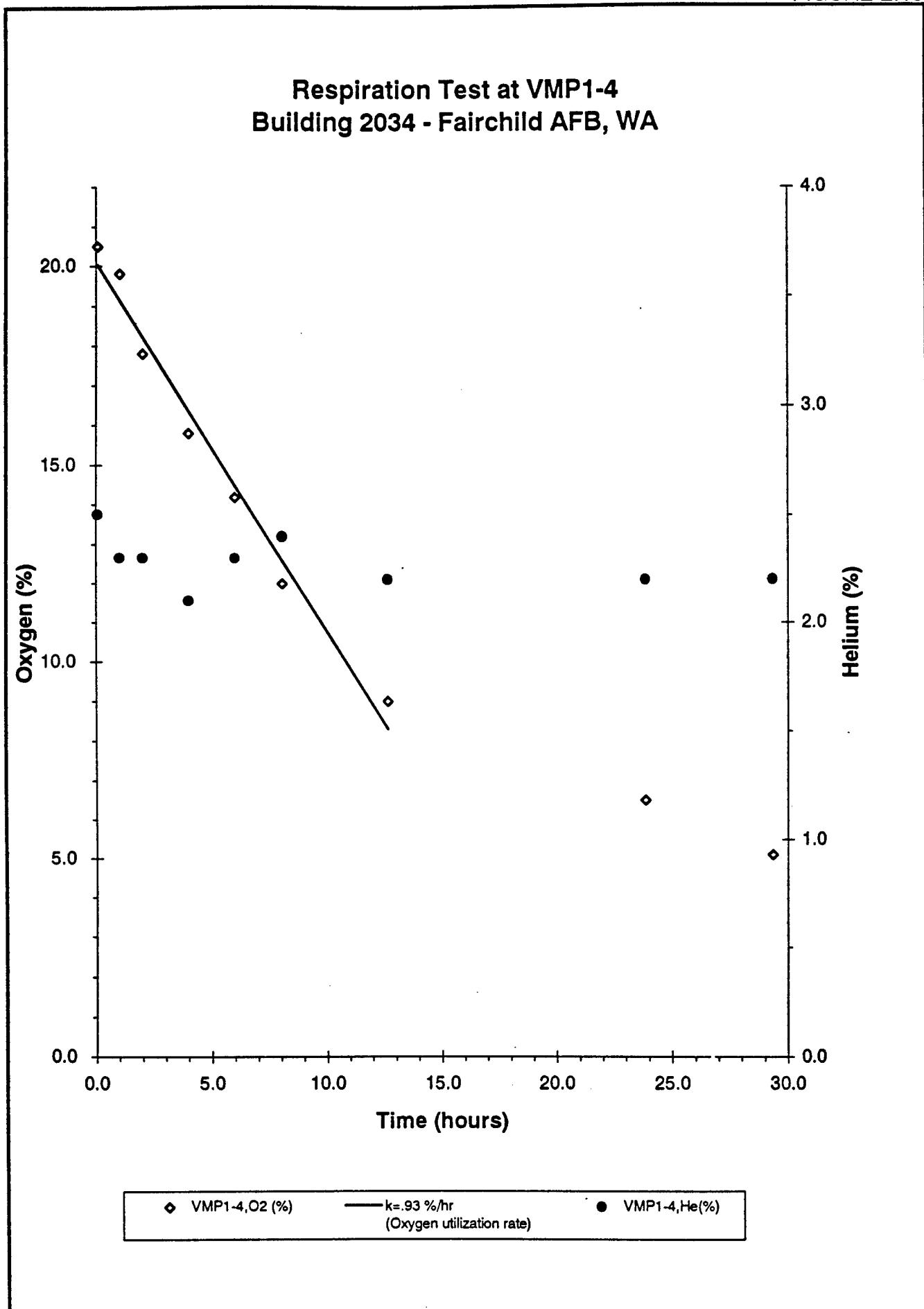


FIGURE E.19

Respiration Test at VMP1-7
Building 2034 - Fairchild AFB, WA

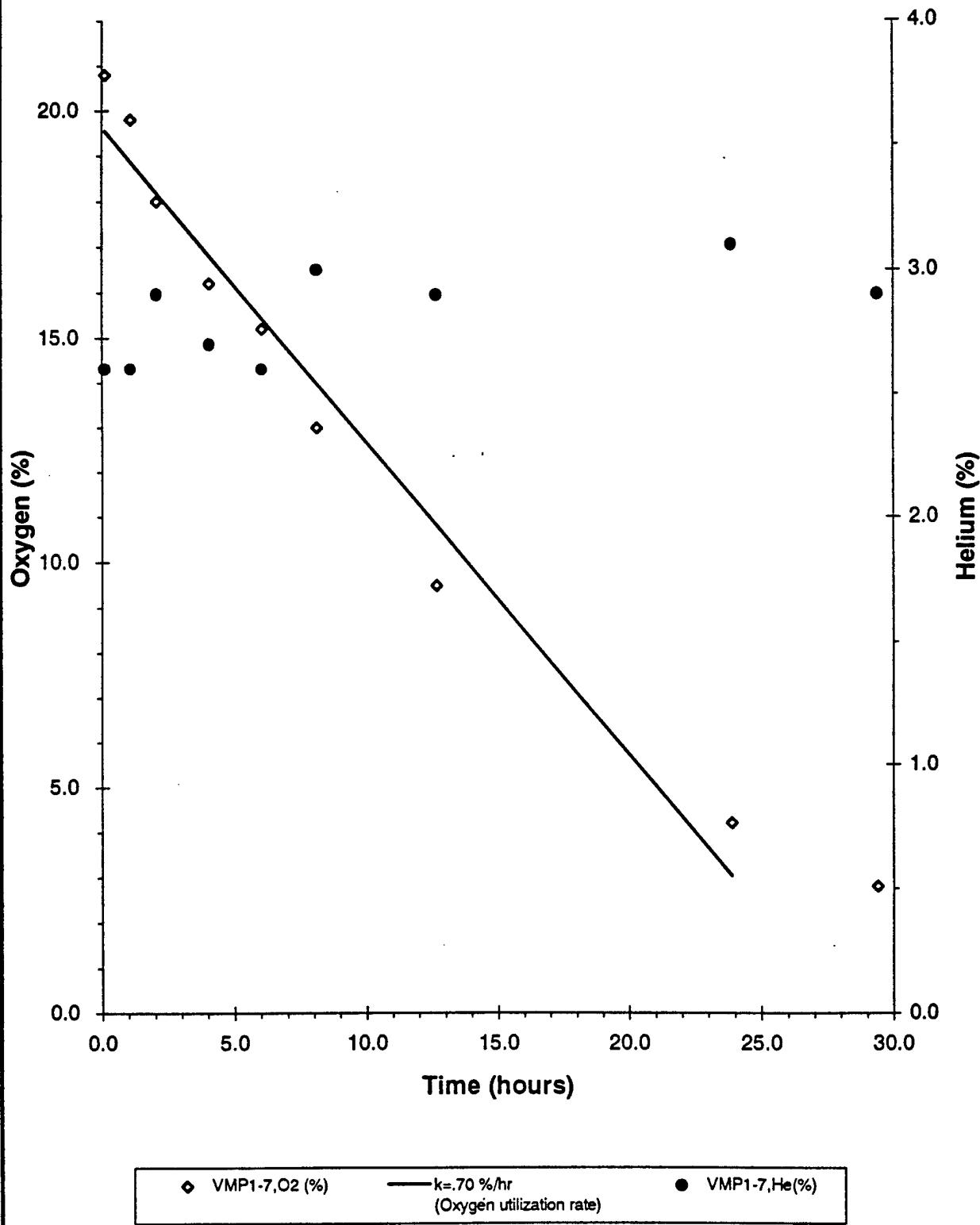


FIGURE E.20

Respiration Test at VMP2-4
Building 2034 - Fairchild AFB, WA

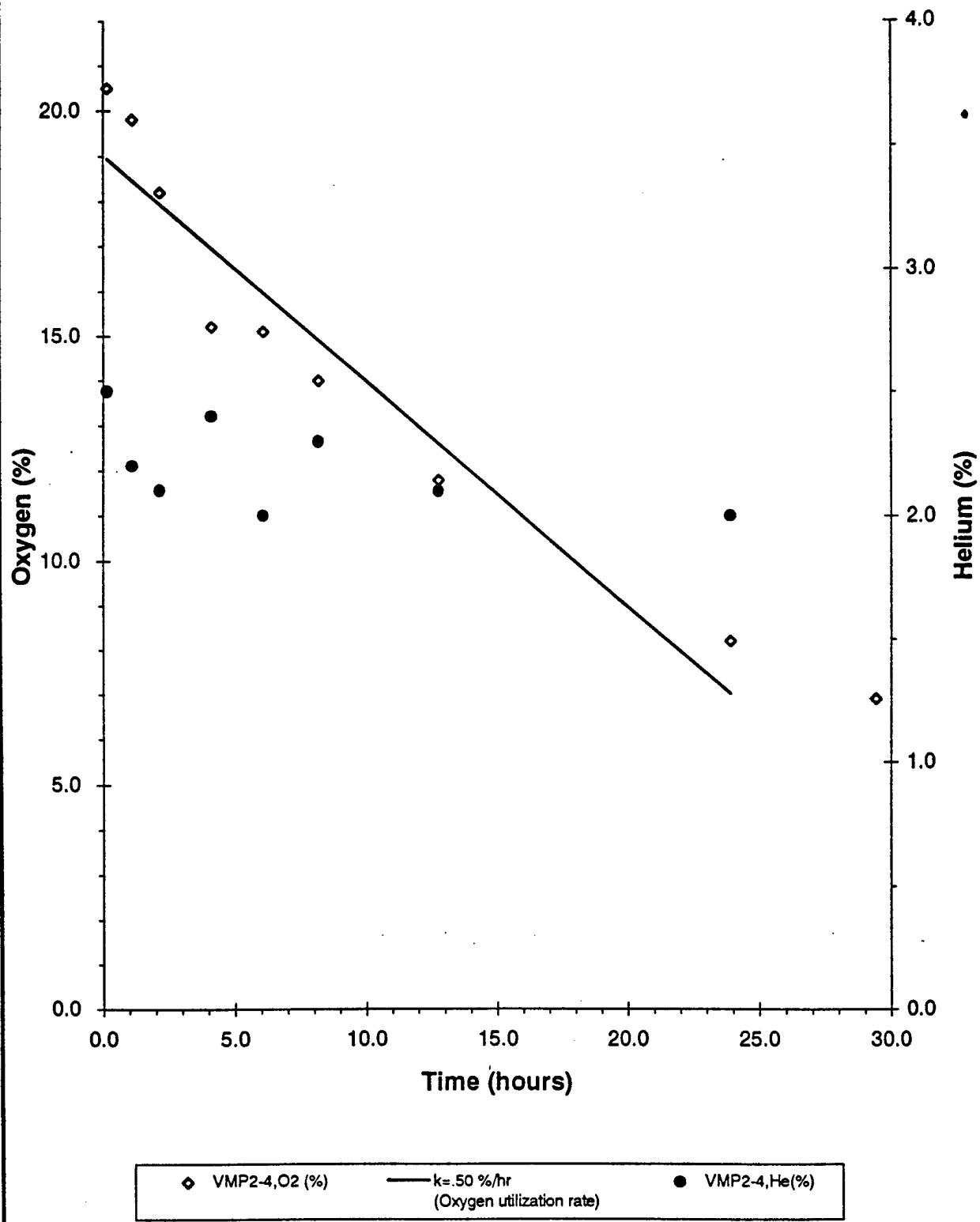


FIGURE E.21

Respiration Test at VMP2-7
Building 2034 - Fairchild AFB, WA

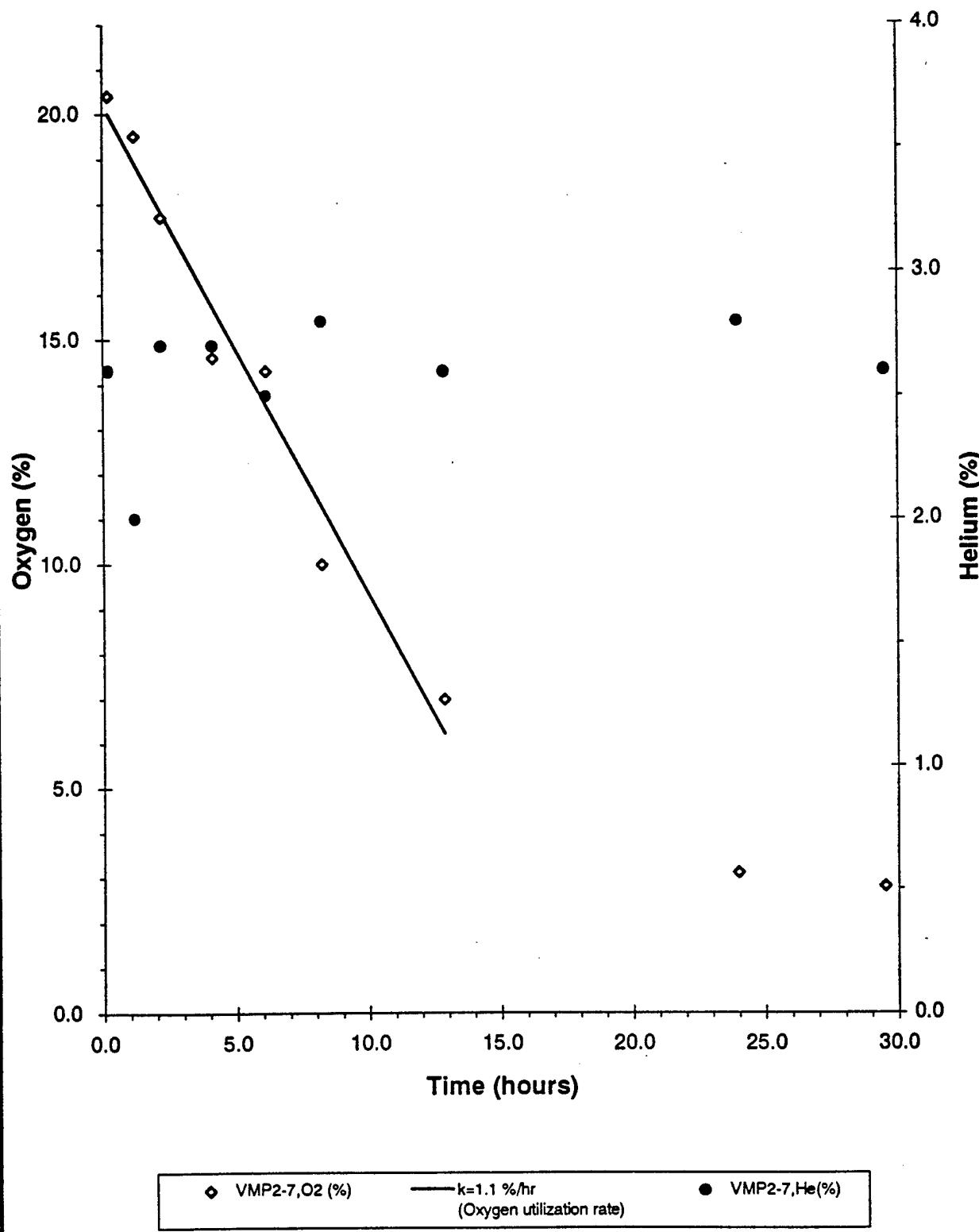


FIGURE E.22

Respiration Test at VMP3-5
Building 2034 - Fairchild AFB, WA

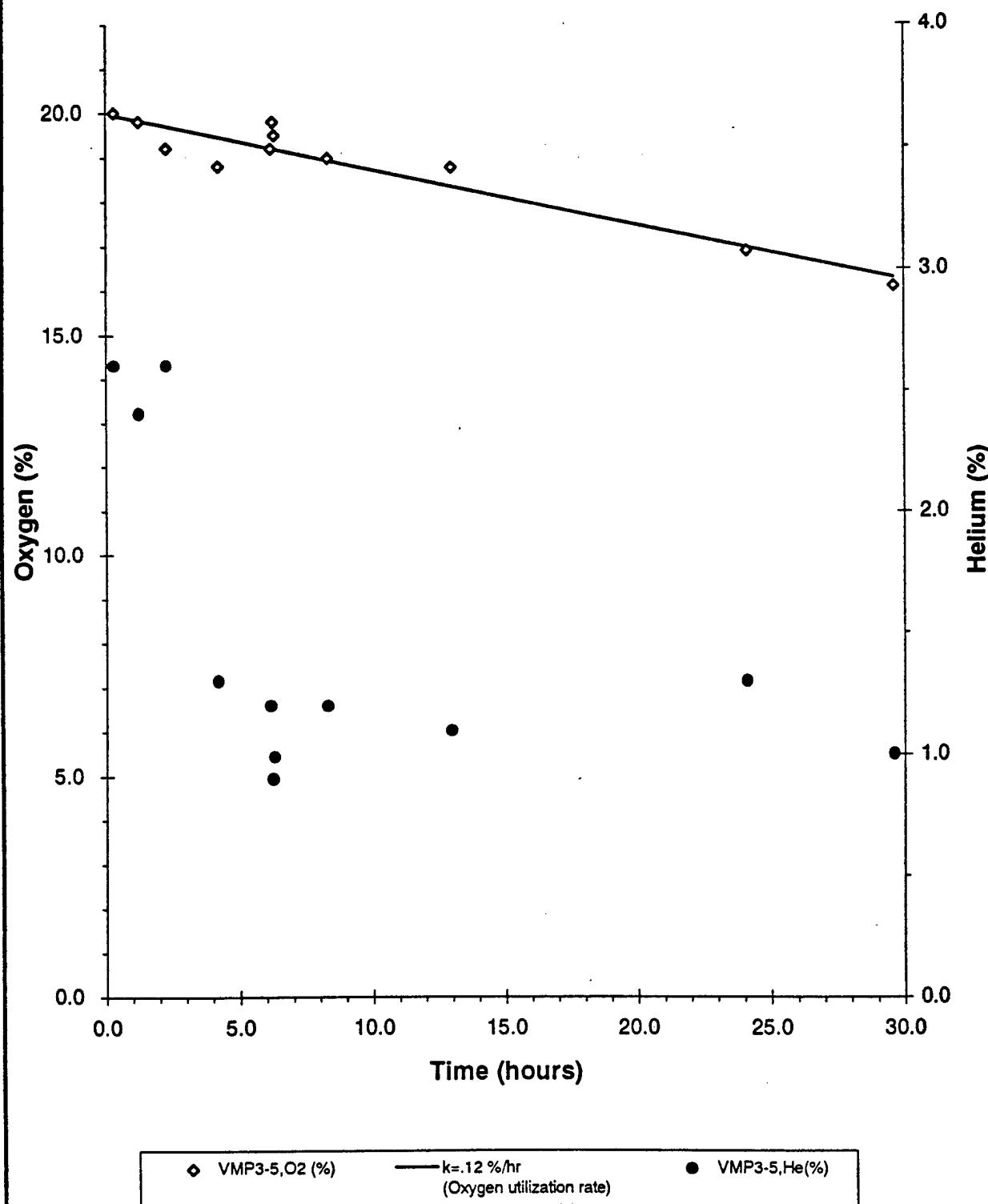


FIGURE E.23

Respiration Test at VMP3-8.5
Building 2034 - Fairchild AFB, WA

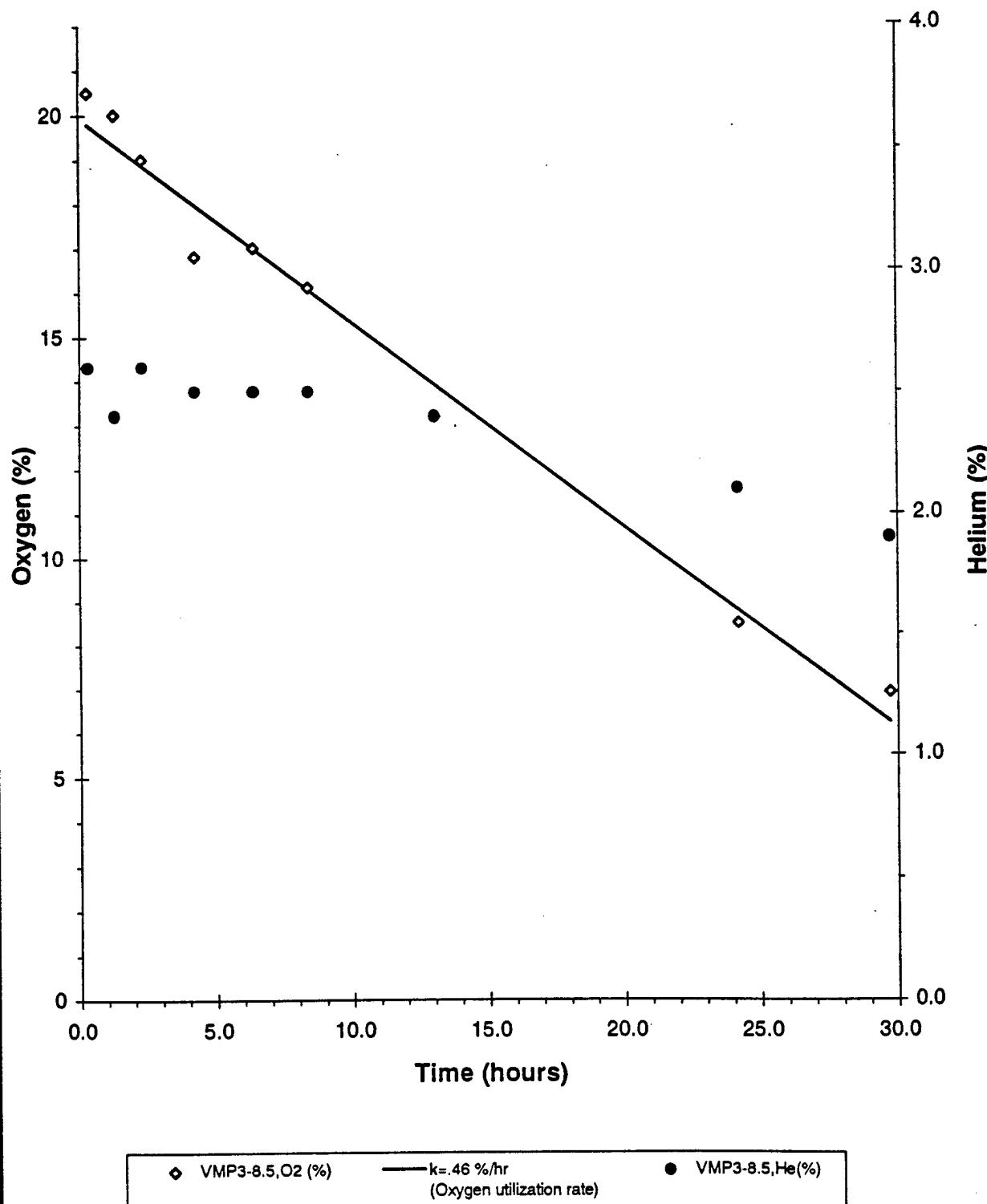


FIGURE E.24

Respiration Test at VW-1
Building 2035 - Fairchild AFB, WA

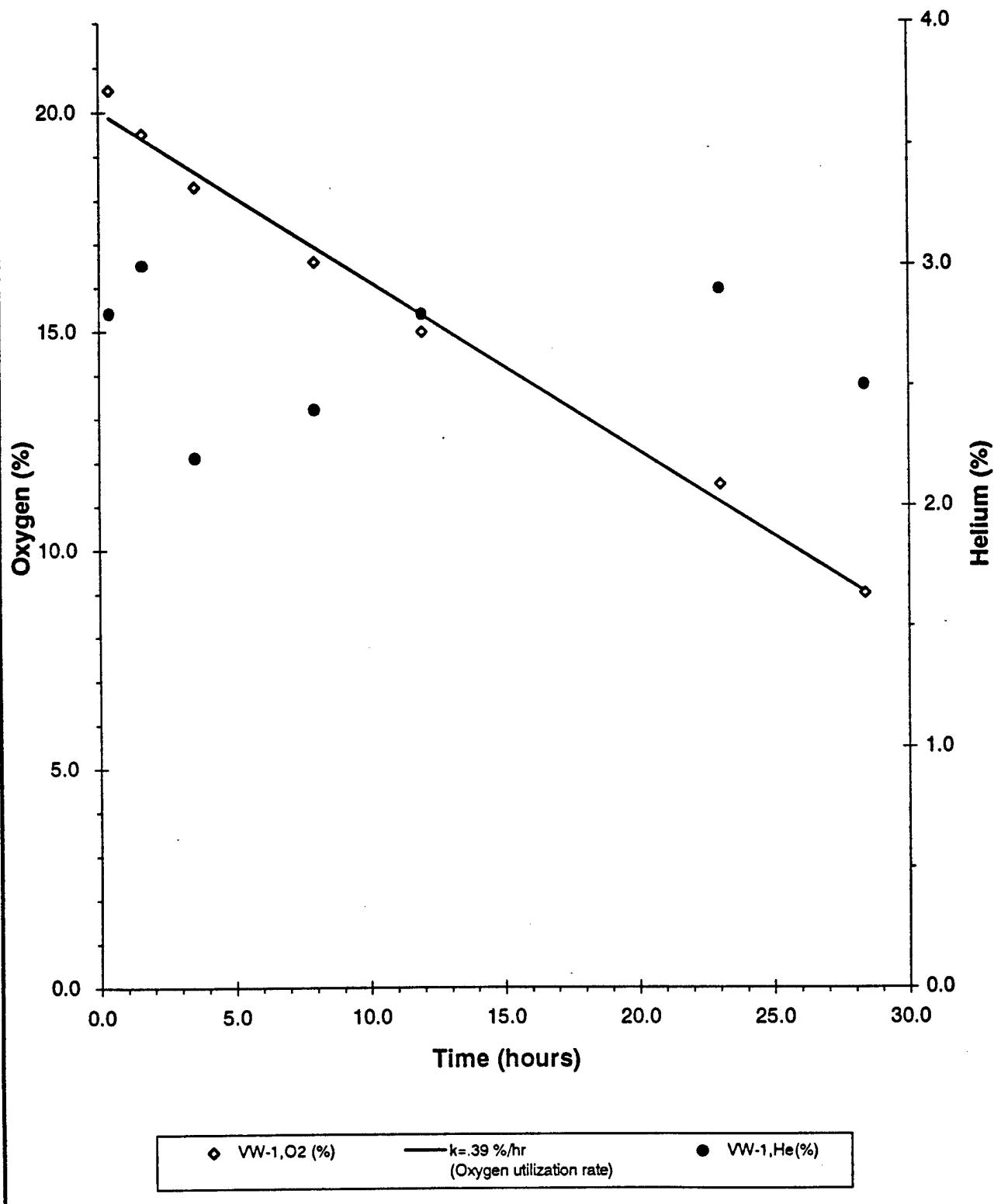


FIGURE E.25

Respiration Test at VMP1-5
Building 2035 - Fairchild AFB, WA

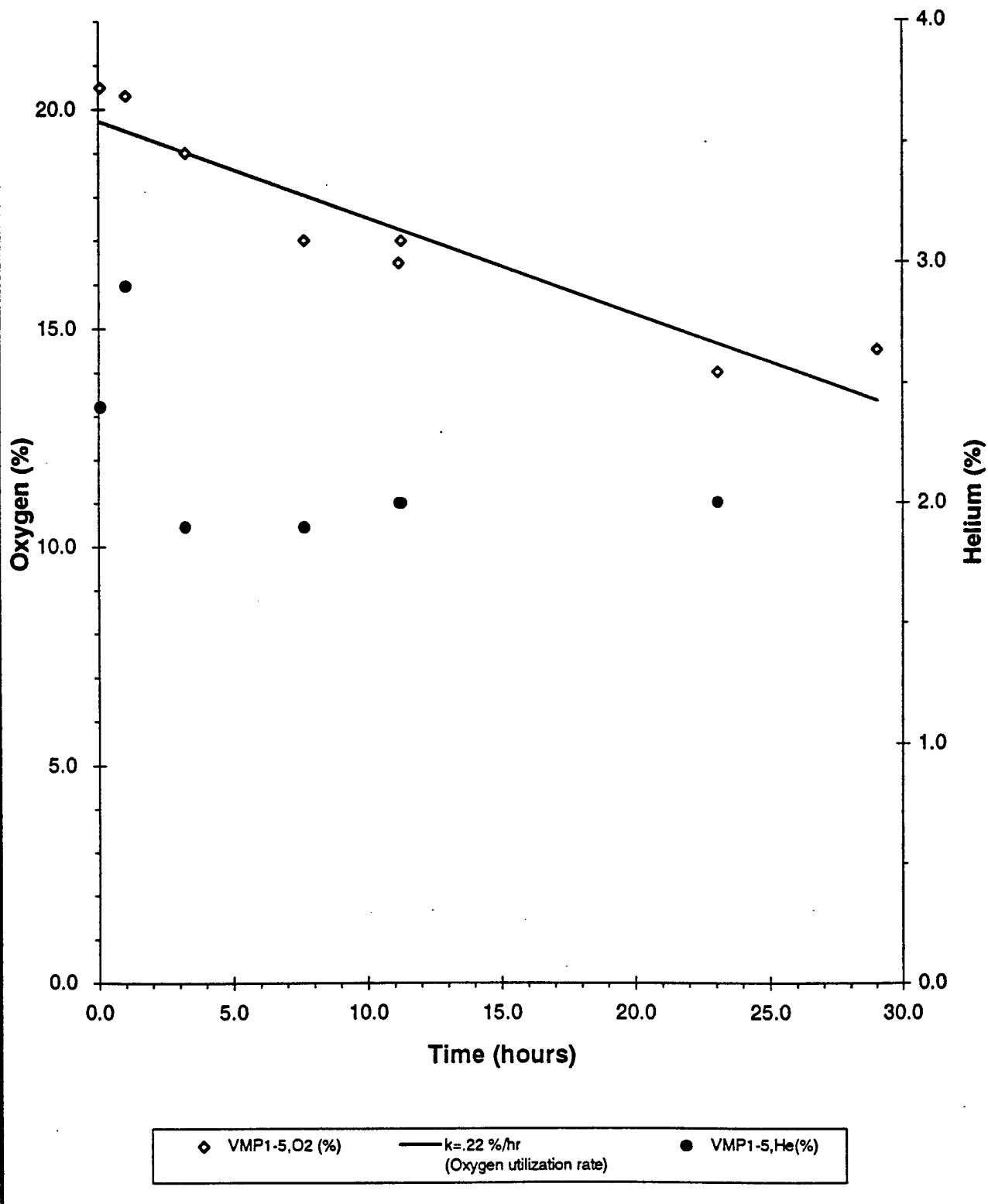


FIGURE E.26

Respiration Test at VMP1-7.5
Building 2035 - Fairchild AFB, WA

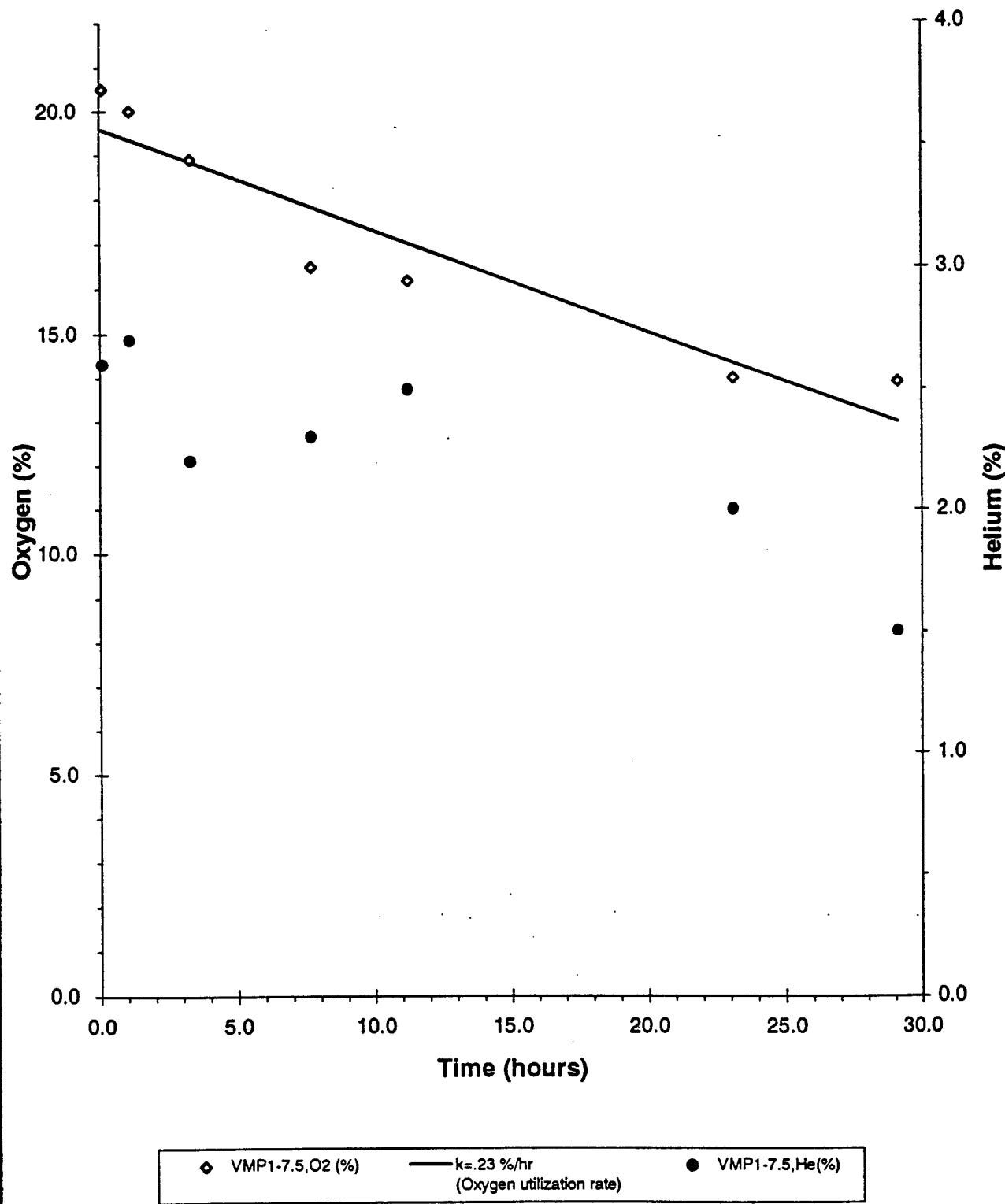


FIGURE E.27

Respiration Test at VMP2-5
Building 2035 - Fairchild AFB, WA

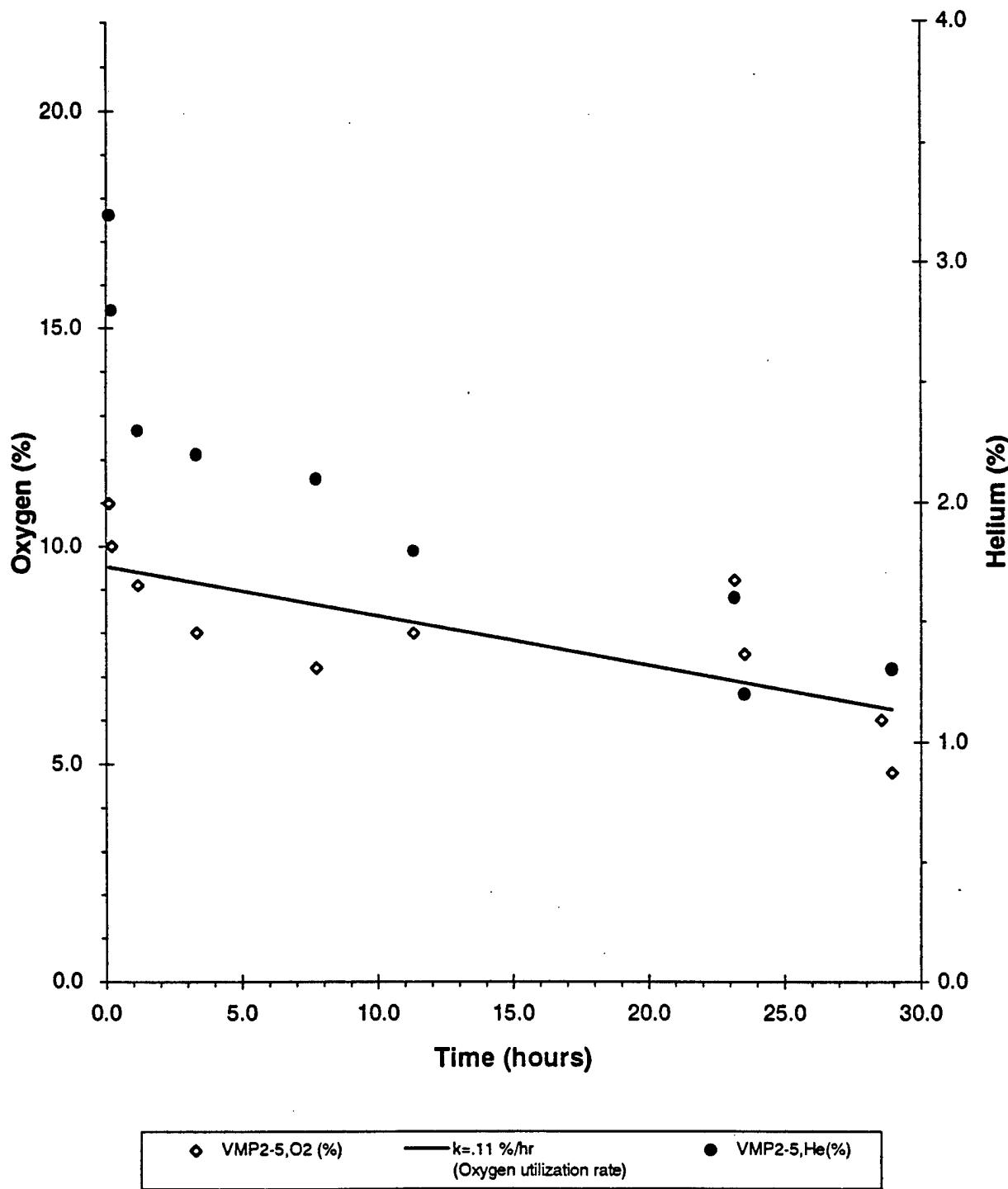


FIGURE E.28

Respiration Test at VMP2-7.5
Building 2035 - Fairchild AFB, WA

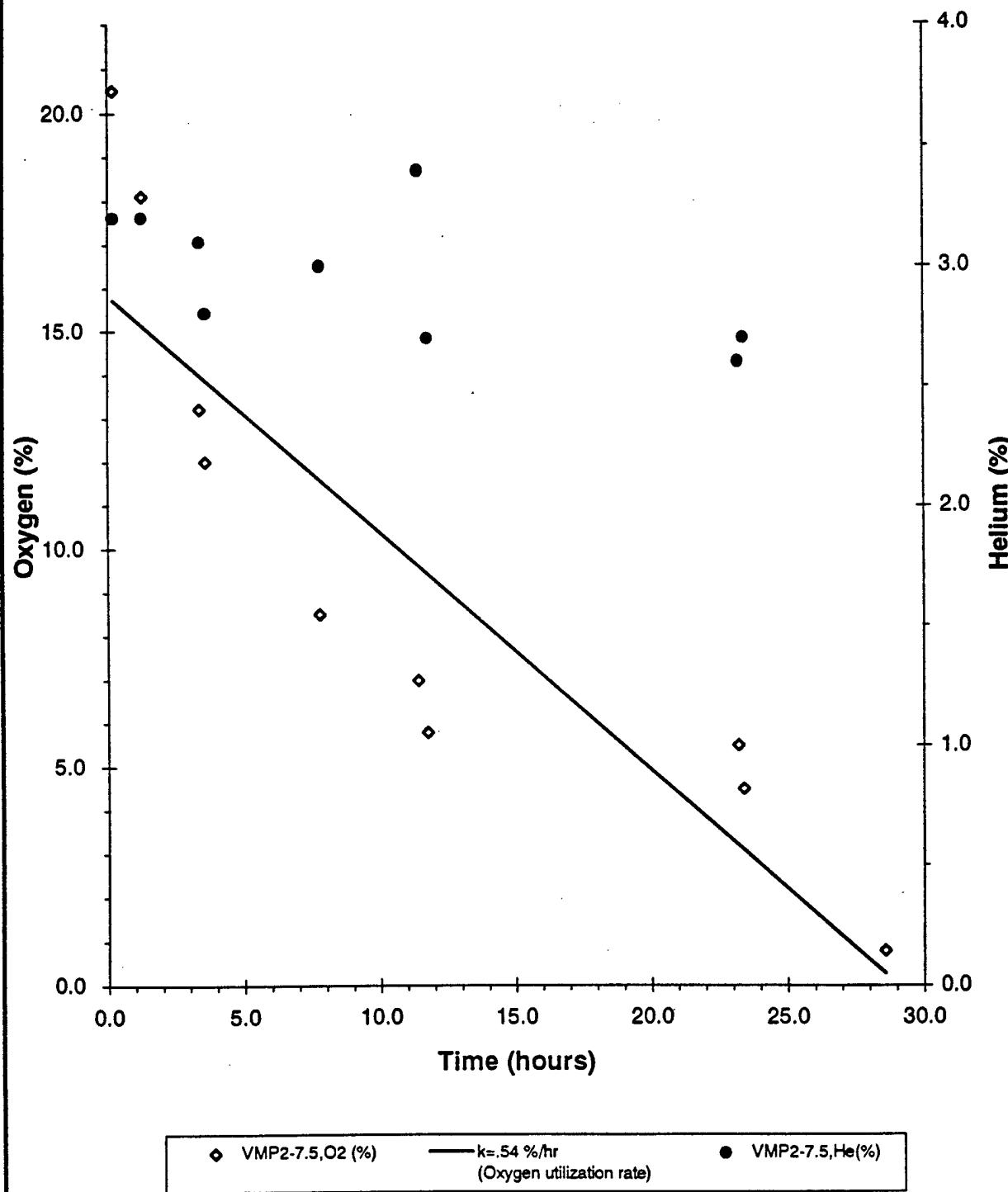


FIGURE E.29

Respiration Test at VMP3-5
Building 2035 - Fairchild AFB, WA

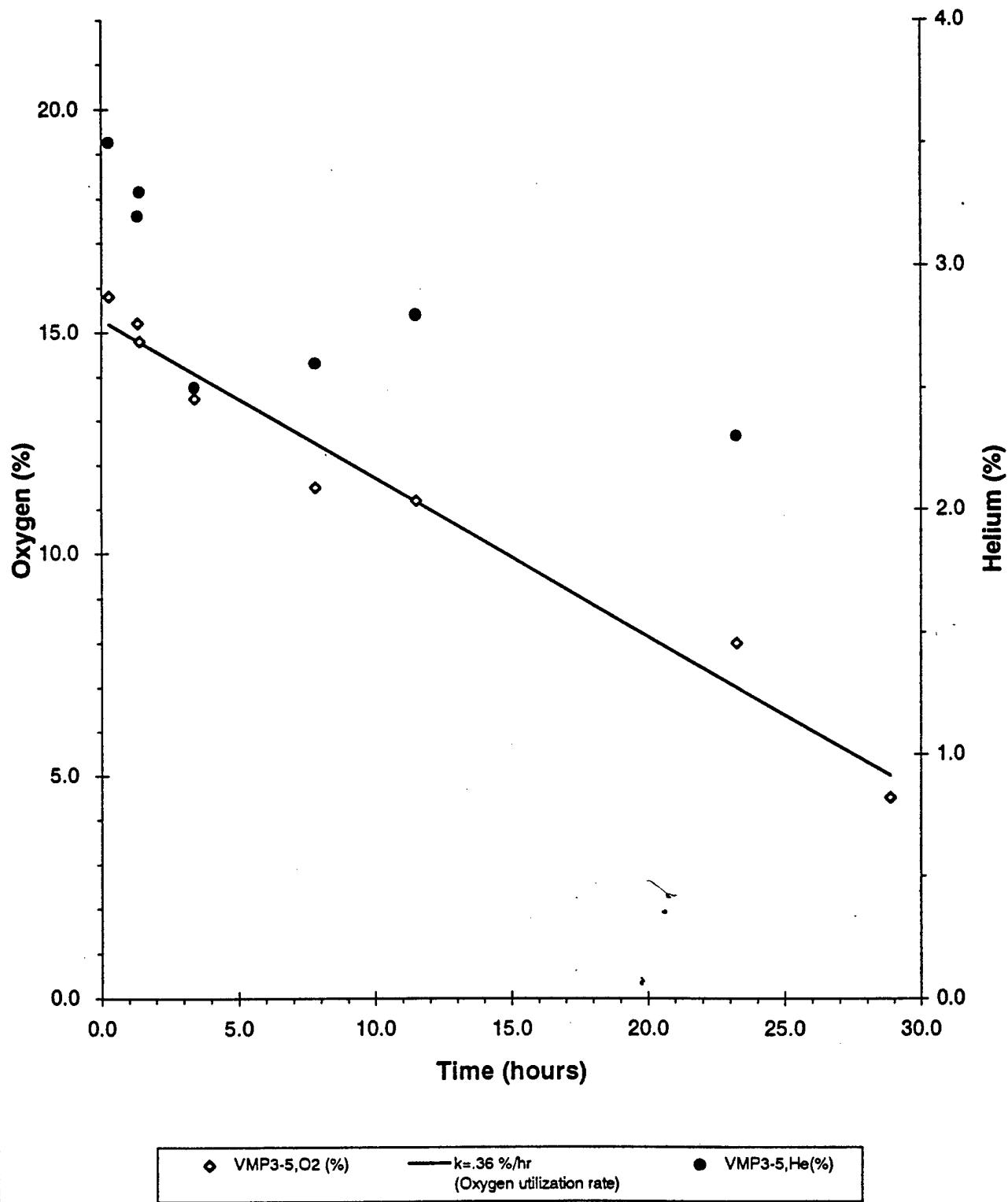
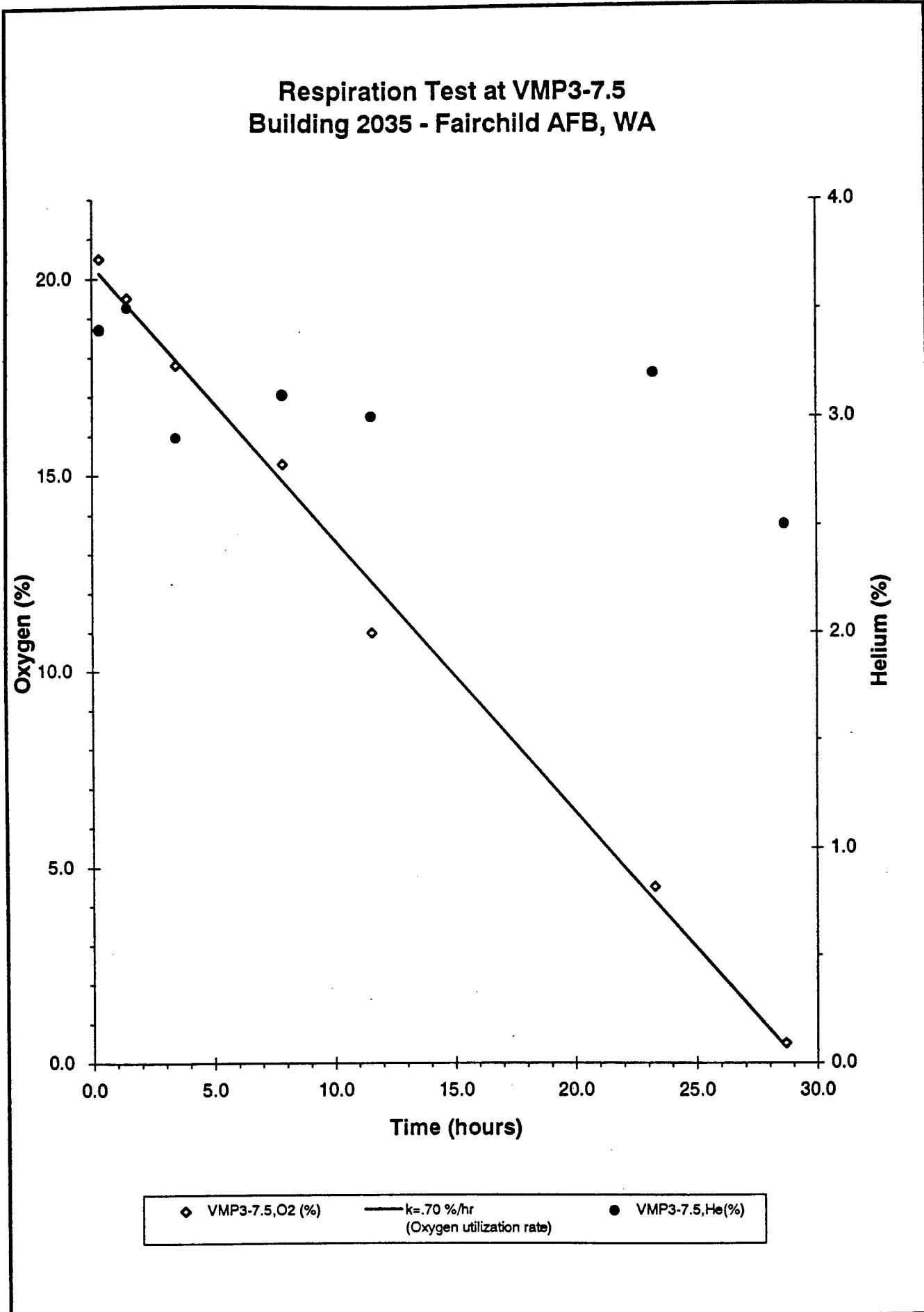


FIGURE E.30



APPENDIX F

BIODEGRADATION RATE CALCULATIONS

Biodegradation Rate Calculations

Site: PS-2

Location: Fairchild AFB, WA

				bloxds 6/10/94
user entered data	VMP1-4 lab	VMP1-7.5 VMP2-4 lab	VMP2-6.5 VMP3-4 lab	VMP3-7 lab
Ko, oxygen utilization rate (%/hr)	0.34	0.48	0.15	1.1
w, moisture content (%)	5.5%	15.0%	9.3%	1.4 7.4% 15.0%
Soil type [from boring logs]	silty SAND	SILT/ CLAY	silty SAND	fine SAND/ SILT
Gravel fraction (% by wt.)	22.9%	-	1.0%	-
Sand fraction (% by wt.)	54.1%	-	64.9%	-
Silt fraction (% by wt.)	14.7%	-	27.0%	-
Clay fraction (% by wt.)	8.2%	-	7.2%	-
n, Estimated porosity (-) [from soil descriptions]	0.35	0.38	0.35	0.37 0.35
TRPH+BTTEX contamination (mg/kg)	425	-	985	-
TVH contamination (ppmv)	78,000	-	-	-
constants				170,000
unit weight of water (g/cm3)	1.0	1.0	1.0	1.0
G, spec. gravity of solids (- or g/cm3)	2.65	2.65	2.65	2.65
Do, density of oxygen (mg/L)	1340	1340	1340	1340
C, carbon/oxygen ratio	0.29	0.29	0.29	0.29 0.29
calculated data				
volume of solids, in 1 L of soil (cm3)	0.65	0.62	0.65	0.63
volume of voids, in 1 L of soil (cm3)	0.35	0.38	0.35	0.37
Dry unit weight (g/cm3)	1.72	1.64	1.72	1.67
e, void ratio (-)	0.54	0.61	0.54	0.59
Sr, degree of saturation	0.27	0.65	0.46	0.68
volume of water, in 1 L of soil (cm3)	0.09	0.25	0.16	0.25
volume of air, in 1 L of soil (cm3)	0.26	0.13	0.19	0.12
bulk density of soil (kg/L)	1.82	1.89	1.88	1.92
A, air filled porosity (liter air/kg soil)	0.140	0.071	0.101	0.062
Kb, biodegradation rate (mg TPH/kg soil per year)	1,600	1,140	510	670 5,070 2,1170
Notes:				
1. lab: soil sample was analyzed by analytical laboratory.				
2. Soil moisture contents of 7.4% (shallow points) and 15% (deep points) assumed for samples not analyzed by lab.				

Biodegradation Rate Calculations

Site: PS-1A

Location: Fairchild AFB, WA

						blocks 6/10/94
user entered data						
Ko, oxygen utilization rate (%/hr)	0.37	0.79	0.80	1.40	1.80	0.71
w, moisture content (%)	13.0%	10.0%	10.0%	6.8%	10.0%	6.3%
Soil type [from boring logs]						
Gravel fraction (% by wt.)	3.7%	-	-	0.5%	-	3.0%
Sand fraction (% by wt.)	79.8%	-	-	54.0%	-	62.4%
Silt fraction (% by wt.)	13.3%	-	-	39.3%	-	27.5%
Clay fraction (% by wt.)	3.3%	-	-	6.2%	-	7.2%
n, Estimated porosity (-) [from soil descriptions]	0.37	0.35	0.40	0.35	0.40	0.35
TPH+BTEX contamination (mg/kg)	452/6,150	-	-	2,000	-	174
TVH contamination (ppmv)	23,000/25,000	-	26,000	-	-	11,000
constants						
unit weight of water (g/cm ³)	1.0	1.0	1.0	1.0	1.0	1.0
G, spec. gravity of solids (- or g/cm ³)	2.65	2.65	2.65	2.65	2.65	2.65
Do, density of oxygen (mg/L)	1340	1340	1340	1340	1340	1340
C, carbon/oxygen ratio	0.29	0.29	0.29	0.29	0.29	0.29
calculated data						
volume of solids, in 1 L of soil (cm ³)	0.63	0.65	0.60	0.65	0.60	0.65
volume of voids, in 1 L of soil (cm ³)	0.37	0.35	0.40	0.35	0.40	0.35
Dry unit weight (g/cm ³)	1.67	1.72	1.59	1.72	1.59	1.72
e, void ratio (-)	0.59	0.54	0.67	0.54	0.67	0.54
Sr, degree of saturation	0.59	0.49	0.40	0.33	0.40	0.31
volume of water, in 1 L of soil (cm ³)	0.22	0.17	0.16	0.12	0.16	0.11
volume of air, in 1 L of soil (cm ³)	0.15	0.18	0.24	0.23	0.24	0.24
bulk density of soil (kg/L)	1.89	1.89	1.75	1.84	1.75	1.83
A, air filled porosity (liter air/kg soil)	0.081	0.094	0.138	0.127	0.138	0.132
Kb, biodegradation rate (mg TPH/kg soil per year)	1,010	2,490	3,700	5,940	8,320	3,140
Notes:						
1. lab: soil sample was analyzed by analytical laboratory.						
2. Soil moisture content of 10% assumed for samples not analyzed by lab.						

Biodegradation Rate Calculations

Site: PS-1B

Location: Fairchild AFB, WA

				<i>biodegradation rate</i>
				6/10/94
<u>user entered data</u>				
Ko, oxygen utilization rate (%/hr)	1.1	0.073	VMP2-5.5	VMP3-5
w, moisture content (%)	14.0%	13.0%	lab	lab
Soil type [from boring logs]	silty SAND	silty SAND	SAND	silty SAND
Gravel fraction (% by wt.)	0.4%	-	0.0%	3.0%
Sand fraction (% by wt.)	44.4%	-	80.3%	62.4%
Silt fraction (% by wt.)	41.3%	-	13.6%	27.5%
Clay fraction (% by wt.)	13.9%	-	6.1%	7.2%
n, Estimated porosity (-) [from soil descriptions]	0.35	0.35	0.40	0.35
TRPH+BTEX contamination (mg/kg)	301	-	1,744	-
TVH contamination (ppmv)	24,000/25,000	-	25,000	-
<u>constants</u>				
unit weight of water (g/cm ³)	1.0	1.0	1.0	1.0
G, spec. gravity of solids (- or g/cm ³)	2.65	2.65	2.65	2.65
Do, density of oxygen (mg/L)	1340	1340	1340	1340
C, carbon/oxygen ratio	0.29	0.29	0.29	0.29
<u>calculated data</u>				
volume of solids, in 1 L of soil (cm ³)	0.65	0.65	0.60	0.65
volume of voids, in 1 L of soil (cm ³)	0.35	0.35	0.40	0.35
Dry unit weight (g/cm ³)	1.72	1.72	1.59	1.72
e, void ratio (-)	0.54	0.54	0.67	0.54
Si, degree of saturation	0.69	0.64	0.48	0.64
volume of water, in 1 L of soil (cm ³)	0.24	0.22	0.19	0.22
volume of air, in 1 L of soil (cm ³)	0.11	0.13	0.21	0.13
bulk density of soil (kg/L)	1.96	1.95	1.78	1.95
A, air filled porosity (liter air/kg soil)	0.055	0.065	0.117	0.065
K _b , biodegradation rate (mg TPH/kg soil per year)	2,050	160	630	2,170
<u>Notes:</u>				
1. lab: soil sample was analyzed by analytical laboratory.				
2. Soil moisture content of 13% assumed for samples not analyzed by lab				

Biodegradation Rate Calculations				biodegs
Site: Bldg 2034				6/10/94
Location: Fairchild AFB, WA				
	VW-1	VMP1-4	VMP1-7	VMP2-4
user entered data	lab	lab	lab	lab
Ko, oxygen utilization rate (%/hr)	0.76	0.93	0.70	0.50
W, moisture content (%)	9.5%	10.0%	8.1%	10.0%
Soil type [from boring logs]	silty SAND	silty SAND	silty SAND	silty SAND
Gravel fraction (% by wt.)	8.7%	-	58.7%	-
Sand fraction (% by wt.)	51.0%	-	33.6%	-
Silt fraction (% by wt.)	28.9%	-	6.1%	-
Clay fraction (% by wt.)	11.3%	-	1.6%	-
n, Estimated porosity (-) [from soil descriptions]	0.35	0.35	0.35	0.35
TPH+BTEX contamination (mg/kg)	1,337	-	1,257	-
TVH contamination (ppmv)	23,000	-	29,000	-
constants				
unit weight of water (g/cm3)	1.0	1.0	1.0	1.0
G, spec. gravity of solids (- or g/cm3)	2.65	2.65	2.65	2.65
Do, density of oxygen (mg/L)	1340	1340	1340	1340
C, carbon/oxygen ratio	0.29	0.29	0.29	0.29
calculated data				
volume of solids, in 1 L of soil (cm3)	0.65	0.65	0.65	0.65
volume of voids, in 1 L of soil (cm3)	0.35	0.35	0.35	0.35
Dry unit weight (g/cm3)	1.72	1.72	1.72	1.72
e, void ratio (-)	0.54	0.54	0.54	0.54
Sr, degree of saturation	0.47	0.49	0.40	0.49
volume of water, in 1 L of soil (cm3)	0.16	0.17	0.14	0.17
volume of air, in 1 L of soil (cm3)	0.19	0.18	0.21	0.18
bulk density of soil (kg/L)	1.89	1.89	1.86	1.96
A, air filled porosity (liter air/kg soil)	0.099	0.094	0.113	0.094
Kb, biodegradation rate (mg TPH/kg soil per year)	2,520	2,930	2,650	1,570
Notes:				
1. lab: soil sample was analyzed by analytical laboratory.				
2. Soil moisture content of 10% assumed for samples not analyzed by lab.				

Biodegradation Rate Calculations		Bioxds 6/10/94
Site: Bldg 2035		
Location: Fairchild AFB, WA		
user entered data	VW-1 lab	VMF1-5 lab
Ko, oxygen utilization rate (%/hr)	0.39	0.22
w, moisture content (%)	6.8%	10.0%
Soil type [from boring logs]	silty SAND	silty SAND
Gravel fraction (% by wt.)	5.4%	-
Sand fraction (% by wt.)	47.2%	-
Silt fraction (% by wt.)	34.6%	-
Clay fraction (% by wt.)	12.9%	-
n, Estimated porosity (-) [from soil descriptions]	0.35	0.35
TRPH+BTEX contamination (mg/kg)	152	-
TVH contamination (ppmv)	17,000	-
constants		
unit weight of water (g/cm3)	1.0	1.0
G, spec. gravity of solids (- or g/cm3)	2.65	2.65
Do, density of oxygen (mg/L)	1340	1340
C _c , carbon/oxygen ratio	0.29	0.29
calculated data		
volume of solids, in 1 L of soil (cm3)	0.65	0.65
volume of voids, in 1 L of soil (cm3)	0.35	0.35
Dry unit weight (g/cm3)	1.72	1.72
e, void ratio (-)	0.54	0.54
Sr, degree of saturation	0.33	0.49
volume of water, in 1 L of soil (cm3)	0.12	0.17
volume of air, in 1 L of soil (cm3)	0.23	0.18
bulk density of soil (kg/L)	1.84	1.89
A, air filled porosity (liter air/kg soil)	0.127	0.094
K _b , biodegradation rate (mg TPH/kg soil per year)	1,660	690
	750	350
		1,350
		1,130
		3,230
Notes:		
1. lab: soil sample was analyzed by analytical laboratory.		
2. Soil moisture content of 10% assumed for samples not analyzed by lab.		